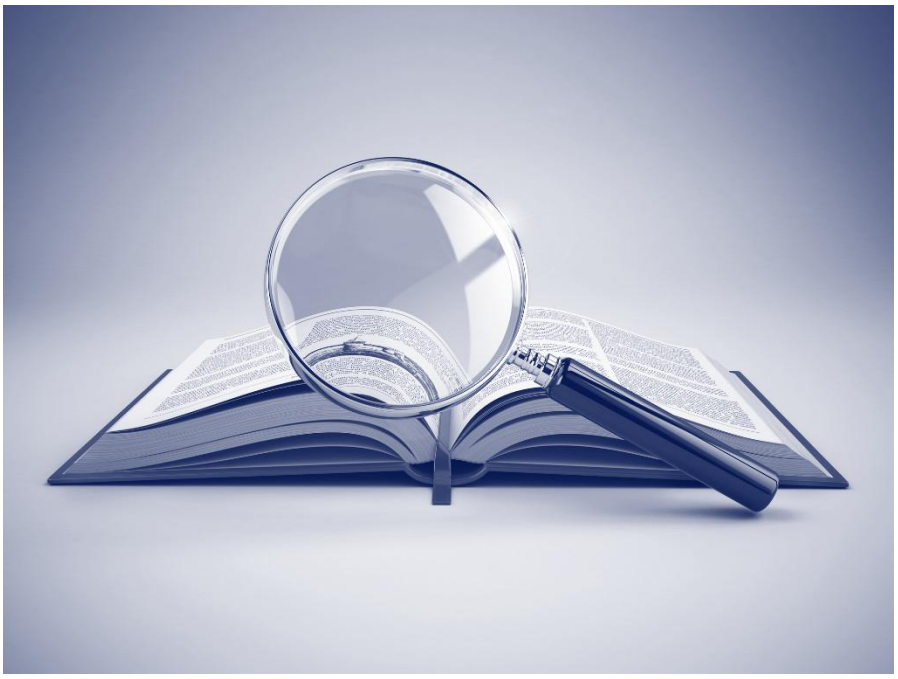

Measure Authoring Development Integrated Environment (MADiE) User Guide

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1 Introduction

Measure Authoring Development Integrated Environment (MADiE) is a software tool that redefines the electronic Clinical Quality Measure (i.e., eCQM, measure) development and testing process by making it a self-contained process that includes dynamic authoring and testing within a single application. MADiE has been further designed to provide an increasingly intuitive and easy-to-use interface by leveraging User Experience Research and Design philosophies. These philosophies continuously incorporate user feedback and iterative design to inform present and future development of MADiE.

1.1 Standards & Integration

MADiE has also been designed to integrate with the nationally recognized data standards that the Centers for Medicare & Medicaid Services (CMS) quality reporting programs use for expressing electronic Clinical Quality Measure (eCQM) logic for machine-to-machine interoperability. This integration provides enormous value to programs using eCQMs, federal policy leaders, and stakeholders, as it demonstrates MADiE's flexibility to facilitate evolving eCQM standards.

MADiE can generate measures following the Fast Healthcare Interoperability Resources (FHIR), Quality Measure Implementation Guide (QMIG) STU 3.0.0, and Clinical Quality Language (CQL) Normative Release. The QMIG specification provides direction for the metadata and framework of measures, while the CQL libraries provide the expression logic for calculating an eCQM. Additionally, MADiE can generate eCQMs containing the FHIR R4 and CQL which describe a measure and programmatically convert both into an executable format that allows calculation of the measure directly from the specification. The currently supported models used within CQL for data interchange requirements are QI-Core and FHIR R4.

In addition to generating measures following the FHIR standard, MADiE also allows users to generate measures compliant with the Quality Data Model (QDM) and Clinical Quality Language (CQL).

Currently, all eCQMs are written using Clinical Quality Language (CQL) and the Quality Data Model (QDM) or Fast Healthcare Interoperability Resources (FHIR). With the release of MADiE, measure developers will transition their measures to QI-Core, utilizing MADiE's improved tools for constructing and testing QI-Core measures. Measure developers can also generate new QDM measures in MADiE.

1.2 Overview of Measure Development & Testing

In MADiE, measure developers can build eCQMs and evaluate their performance by building out measure logic, creating synthetic patient records (referred to as test cases), and testing those synthetic patient records against a measure's logic. That process allows measure developers to understand the behavior of a measure's logic under semi-realistic scenarios and whether a measure's logic encodes their intent, through a process of iteration and testing.

1.3 Purpose of this Guide

The purpose of this document is to further describe MADiE and provide step-by-step instruction for engaging with key functionality used to create QDM and QI-Core measures. Many key functionalities in MADiE are the same for QDM and QI-Core with the differences between the models highlighted. Functionality works the same for both models if this guide doesn't specify a difference between QDM and QI-Core.

2 System Requirements & Availability

MADiE is available 24 hours a day, 7 days a week and can be accessed with an internet browser. Chrome, Firefox, and Edge are recommended. MADiE may not be available during system maintenance. MADiE users will be notified by email about scheduled and unscheduled system maintenance.

MADiE does not support copying text from Microsoft Word and pasting directly into MADiE. Copying from Microsoft Word can add symbols, accented letters, and characters from different languages into MADiE that will result in MADiE errors, including the inability to save.

3 User Account Creation

There are a few steps required in creating an account and gaining access to MADiE. New MADiE users must first create a HARP account then request access to MADiE in HARP as detailed in the following sections.

3.1 Creating a HARP Account

New users must have a HARP Account to log in to MADiE. To create a new HARP account, go to https://harp.cms.gov/register and complete the registration process to create your HARP account. Registration requires users to enter profile information, account information, and successfully complete proofing (identify verification). HARP uses a third-party service provided by Experian to verify user identities.

After creating your HARP account, set up two-factor authentication if you have not already done so by following these steps:

1. After logging in to HARP, click on "Manage Two-Factor Devices."
2. Add a device and follow the prompts.

3.2 Configuring Your HARP Account for MADiE

To complete HARP account setup for use with MADiE, follow the instructions in the MADiE Access Guide found in the Training & Resources tab of the public website.

3.3 HARP Account Management

To update your HARP Profile including your password, name, email address, and phone number log in to HARP and click on "View / Edit Profile Information."

4 Logging in to MADiE

To log in to MADiE, follow these steps:

1. In the MADiE login form, enter your HARP User ID
2. Enter your HARP password.
3. Click the "Sign In" button.
4. You will be presented with a two-factor authentication, as determined by your HARP profile setting. Enter the authentication and you will be logged into MADiE.

4.1 Application Timeout

A user will automatically be logged out of MADiE after 30 minutes of inactivity. After 25 minutes of inactivity, a warning message will be displayed, indicating that their session will expire if the user remains inactive. **Note:** MADiE does allow users to work in more than one website tab or window. However, inactivity in one will log users out in all open MADiE instances.

4.2 Long-term Account Inactivity

The MADiE-user role assigned to a MADiE user's HARP account will be deactivated if a user has not logged into MADiE for 60 days. A warning email, notifying a user of such will be sent if a user has not logged into MADiE for 30 days.

4.3 Forgotten User ID or Password

If you experience trouble logging in to MADiE, check that you are using your personal HARP User ID and password and have had the MADiE user role assigned through HARP. If you have not completed that yet, follow the instructions in the MADiE Access Guide found in the Training & Resources tab of the public website.

If you have forgotten your HARP ID or password, go to the HARP Account Recovery page to retrieve your HARP User ID or reset a password.

4.4 UMLS® Integration

For MADiE to function properly, MADiE must connect to the Value Set Authority Center (VSAC). VSAC is provided by the U.S. National Library of Medicine (NLM) in collaboration with the Office of the National Coordinator (ONC) for Health Information Technology and CMS. The VSAC provides downloadable access to previously created value sets and direct referenced codes and is actively incorporating new value sets for other use cases, new measures, and for updating existing measures.

4.4.1 Requesting License

To integrate with the Value Set Authority Center (VSAC) through MADiE, users are required to have a Unified Medical Language System© (UMLS) Metathesaurus License. To request a license and create a UMLS account, go to UMLS Terminology Services Sign Up Page.

4.4.2 Connecting to UMLS/VSAC for Value Set Data

Once logged into MADiE, you can establish an active connection to the VSAC and retrieve value set data. Click on the 'Connect to UMLS' link in the upper right of the header on any MADiE page to connect. Upon clicking, a "Please sign in to UMLS" modal will appear. Enter the API key associated with your UMLS account to connect. If you do not know your API key, follow the "WHERE'S MY KEY?" instructions. Once connected, the Connect to UMLS link will now read "UMLS Active," and the dot indicator will change from red to green. MADiE will retain your UMLS Active status and users will only need to log into UMLS in MADiE one time.

4.4.3 Signing out of UMLS/VSAC

MADiE retains the UMLS login and will not automatically sign users out. Should a user need to sign out of UMLS, they can do so. Select the drop-down arrow next to the UMLS Active button, then select Sign Out. Users will then be signed out of UMLS and can log in with a different API key.

Image: UMLS Sign Out Dropdown

5 MADiE Alerts

MADiE provides numerous types of alerts on all pages and tabs. There can be three different types of alerts:

1. **Success Alerts**: Displayed when the action performed by the user was successful (e.g., successfully saved CQL.) Success alerts are denoted with a green checkmark.
2. **Warning Alerts**: Displayed when the action performed by the user was successful, however there may be things the user needs to review (e.g., successfully saved CQL, but some of the CQL may go against CQL recommendations.) Warning alerts are denoted with an orange exclamation mark.
3. **Error Alerts**: Displayed when the user needs to take action (e.g., required field is not filled in.) Could also be displayed when the action performed by the user was successful, but the data is invalid (e.g., CQL was saved, but the CQL is not valid.) Error alerts are denoted with a red x.

These Alert messages might be displayed as a message that will appear at the top of the page, stay for a few seconds, and then clear. Users can also clear the messages by clicking the "x" in the right corner of the alert.

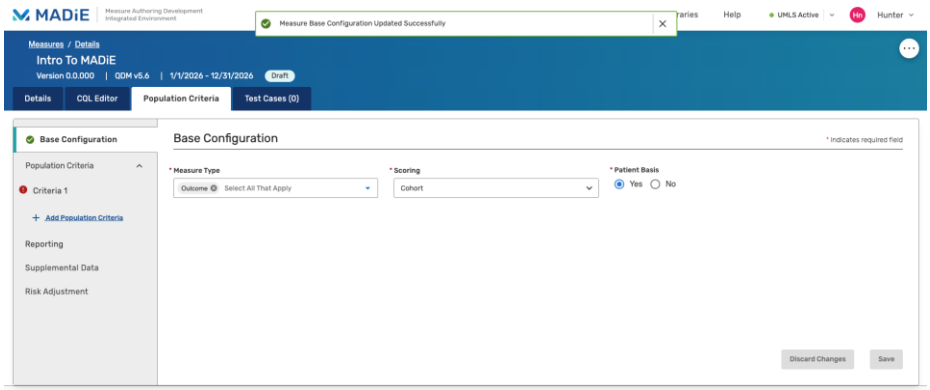


Image: Succes Toast Message Example

Alert message will also appear in a span at the top of the page the user is on. These alerts messages will have two icons:

1. **Minimize Icon**: This icon allows users to minimize the error message to give them more space on the screen to do other work. To expand the error message again users can hit the Maximize Icon in the header. See second image below.
2. **Copy Icon**: Clicking this icon will copy the error message to the user's clipboard, from there users can paste the error message into a different text editor tool to see all messages more easily or save them for later reference.

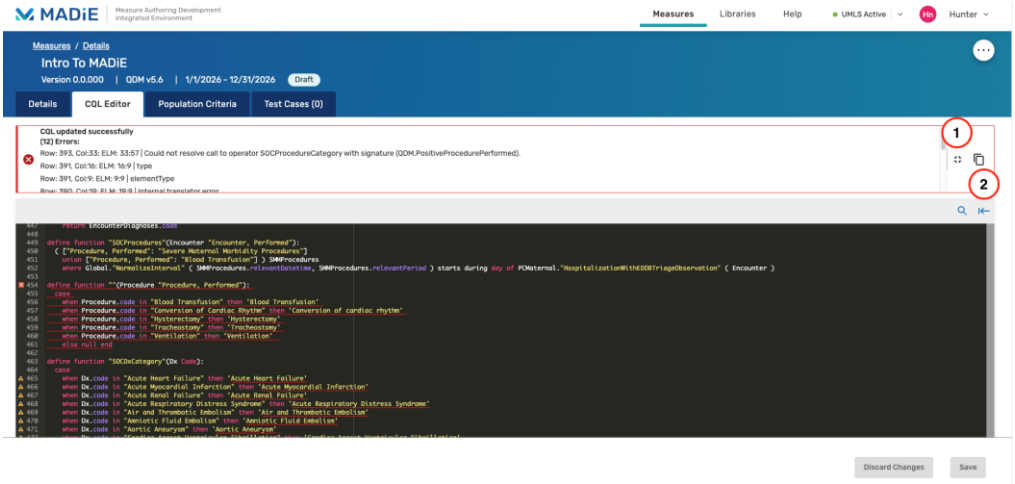


Image: Error Message Button

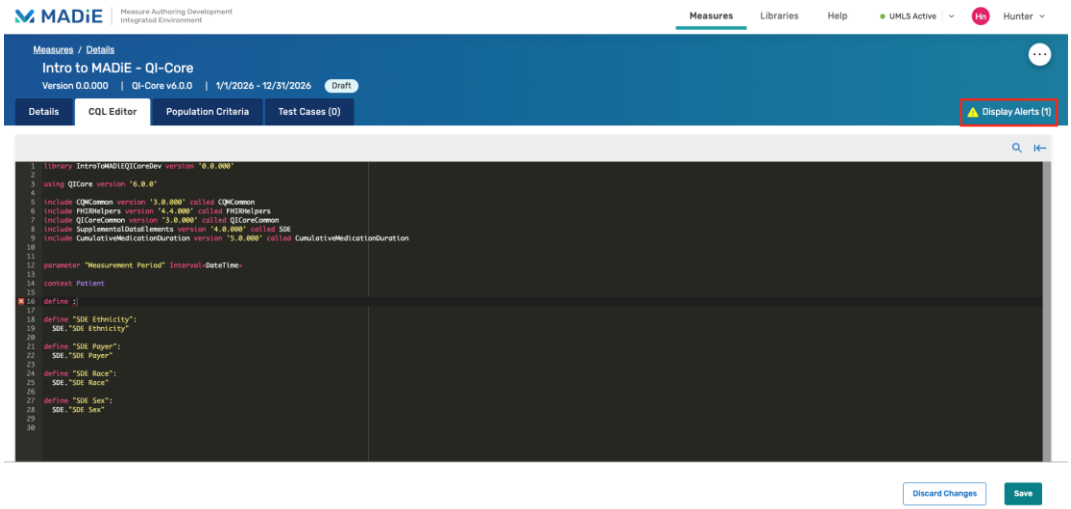


Image: Error Maximize Icon

6 Primary Navigation Header (White Header Bar)

The Primary Navigation Header is found at the top of every area in MADiE. It provides access to the following navigation and functionality that are always accessible:

1. **MADiE Logo:** The MADiE Logo (in the far left of the Primary Navigation Header) provides navigation to the Measures page (the initial landing page upon logging in), where both a user's eCQMs and all other eCQMs entered into MADiE can be accessed.
2. **Measures:** The Measures link (the first link in the right half of the Primary Navigation Header) provides navigation to the Measures overview page (the initial landing page upon logging in), where both a user's eCQMs and all other eCQMs entered into MADiE can be accessed.

3. **Libraries:** The Libraries link (the second link from the left in the right half of the Primary Navigation Header) provides navigation to the Libraries page, where both a user's standalone CQL Libraries and all other CQL Libraries entered into MADiE can be accessed.
4. **Help:** The Help link (the third link from the left in the right half of the Primary Navigation Header) provides navigation to help and troubleshooting resources. This will navigate you away from MADiE, opening a new window.
5. **Connect to UMLS / UMLS Active:** When a user is not connected to the UMLS and thus not connected to the VSAC, the Connect to UMLS link (fourth link from the left in the right half of the Primary Navigation Header) is displayed. Clicking on the link opens a modal to connect as described in section 4.2. When connected, "UMLS Active" is displayed instead.
6. **User Profile Dropdown / Sign Out:** The User Profile Dropdown (on the far right of the Primary Navigation Header) provides a link for a user to "Sign Out."

Image: MADiE Primary Navigation Header

7 Measures Overview Page (Initial Landing Page)

The Measures overview page is where users land after logging in to MADiE. This page displays all QI-Core and QDM measures that have been added to MADiE and further organizes the measures into three areas: Owned Measures, Shared Measures, and All Measures.

1. **Owned Measures:** Displays all measures you've created or currently own. You have full editing and management rights over these measures.
2. **Shared Measures:** Lists measures that have been shared with you by other users. You can view and edit these measures and their test cases, but functionality only owners can perform will be unavailable for you.
3. **All Measures:** Provides a complete view of all measures available in MADiE. This tab is ideal for users who need to reference a measure they don't have edit access to. Most of the measures listed in All measures are likely to be view-only, since most measures are only editable by a limited number of users.

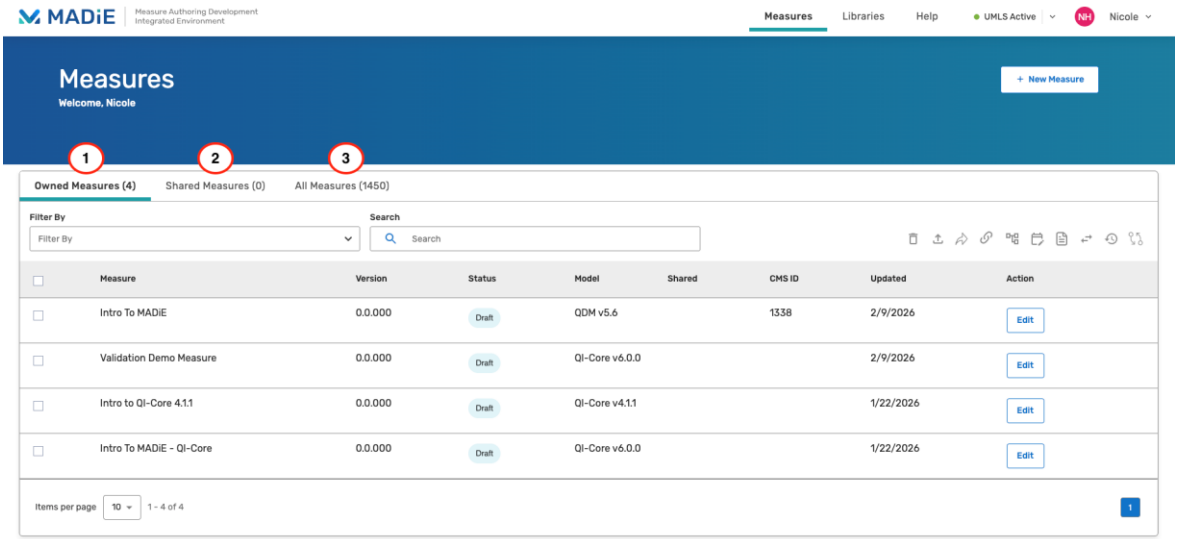


Image: Measure Tabs

7.1 Measure Tables

All three tabs list measures in tables that also display the following information and interactive controls for each measure.

1. **Measure:** The Measure Name column displays the name of a measure.
2. **Version:** The Version column displays the version number of the measure listed.
3. **Status:** Shows the current Status of the measure. Measures that are currently in a draft state will show a blue tag 'Draft' in this column.
4. **Model:** The "Model" column displays the assigned model and version of the measure.
5. **Shared:** The "shared" column displays a green check mark if the measure is shared with others. **Note**: This column does not appear on the Shared Measures Tab.
6. **CMS ID:** Displays the measure's CMS ID, if applicable.
7. **Update:** Displays the date the measure was last updated.
8. **Actions:** This column will contain one of the following buttons:
    a. **Edit**: Draft measures the user owns or has share access to will have an Edit button. This allows users to open the measure for editing.
    b. **View**: Versioned measures or measures the user does not own or have share access to will have a View button. This allows users to open the measure for view-only access.
9. **Filter By / Search:** Fields utilized to search for a specific measure. See section 7.1.3 for more details.
10. **Measure Action Center:** Allows users to perform an action on a selected measure. See section 7.1.1 for more detail.
11. **Measure selector:** Allows users to select one or more measures.

12. **Measure Expansion Icon:** If a measure displays this icon, it indicates the measure has additional measures in the measure set and they are grouped together. See section 7.1.2 for more details.

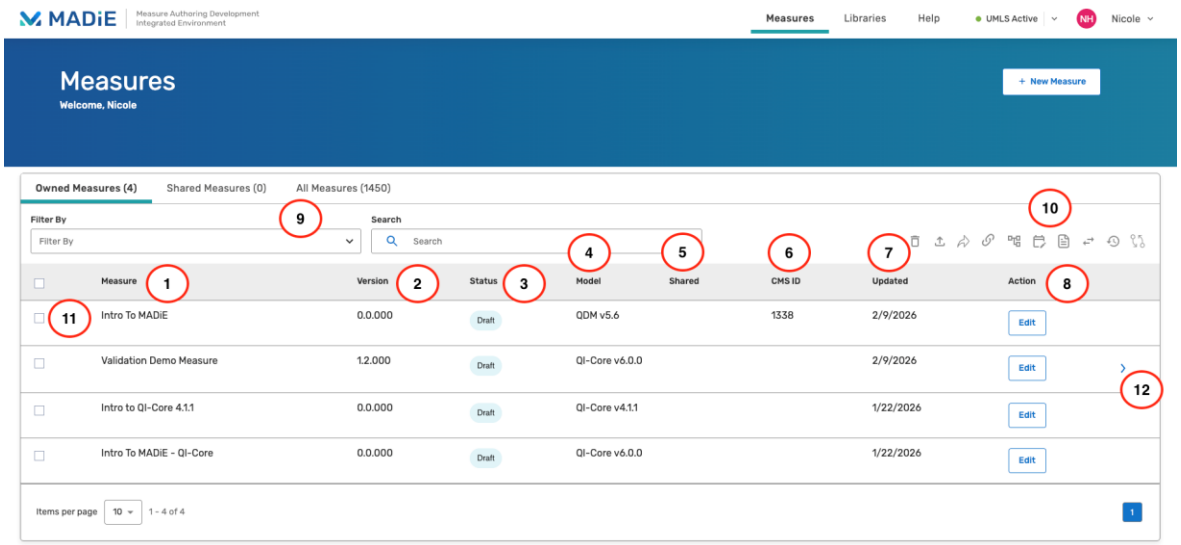


Image: Owned Measures Tab

The Measures tabs also have pagination. This allows users to specify how many measures to see on the page at once. Users can specify 10, 25, 50, or All measures to see and MADiE will remember that selection and continue to show that number of measures or libraries until the user updates the number shown. **Note:** The option "All" is not available on the All Measures and All Libraries tabs. MADiE also stores the tab and pagination page the user was on when navigation happens. When a user navigates back to the Measure List page MADiE will return you to the tab and page that was previously displayed.

7.1.1 Measure Action Center

The measure action center in MADiE is where users can take different actions on a measure. First, select the measure, then users can select an option by clicking the icons in the action center. The available actions are:

1. **Delete**: Allows users to delete the selected measure. Only measures in a draft status may be deleted. Engaging Delete Measure will display a modal confirming if you would like to remove the measure and all its test cases. **Note:** Only the measure owner can delete a measure.
2. **Export**: Allows users to export the selected measure. After clicking export a dropdown will appear allowing user to select "Export" or "Export for Publishing." See section 10.
3. **Share:** Allows users to share one to many measures with different users. See section 12.2.1.

4. **Associate:** Allows users to associate a QDM measure to a QI-Core measure, copying the CMS ID and optionally the metadata. Two measures must be selected for this icon to be enabled. See section 7.4
5. **Version**: Allows users to version the selected measure. If the icon is disabled, the selected measure is not available to be versioned. See section 7.2
6. **Draft**: Allows users to draft the selected measure. If the icon is disabled, the selected measure is not available to be drafted. See section 7.3
7. **View Human Readable:** This allows users to view the Human Readable in a pop-up in MADiE. The measure CQL must not contain errors, and the population criteria must be set up before the View Human Readable action will be enabled. If you get an error stating the Human Readable is not available for this measure, verify those elements are valid and try again. From the view human readable modal users can also export the measure. Scroll to the bottom of the modal and an "Export" button is present. Clicking this will export the measure for the user. **Note**: This is the full measure export, not just the Human Readable file. For more information on exporting measures see section 10.
8. **Transfer Measure:** Allows users to transfer the selected measure or measures to another MADiE User. See section 12.3.1 for more information.
9. **View Measure History:** This icon allows users to see information about the measure history. See section 7.5.
10. **Compare Measure Versions:** This icon becomes enabled when two different measure versions of the same measure are selected and clicking it will display a popup detailing the differences between the measure versions. See section 7.6 for more information.

Image: Action Center Icons

7.1.2 Measure Grouping

In MADiE, measures that belong to the same measure set (different versions of the same measure) are grouped together to improve organization and usability. Only the most recent measure draft or version is displayed by default. This bundling allows users to easily view and manage related measures in one place while streamlining the measure list.

On the measure list page, bundled measures are indicated by a measure expansion icon to the right of the View or Edit button. Clicking this icon will expand the table to reveal all measures

within that set. This feature helps users quickly identify which measures are part of the same set and navigate between them without leaving the page.

Bundling is based on shared measure set identifiers, which link versions of a measure together. This is especially useful for users working across multiple versions during development, testing, or validation workflows. Within each bundled group, measures are sorted in descending version order, meaning the highest version number appears first. If a draft version of a measure exists, it will automatically appear at the top of the list, making it easier to locate and work with the most current or in-progress version.

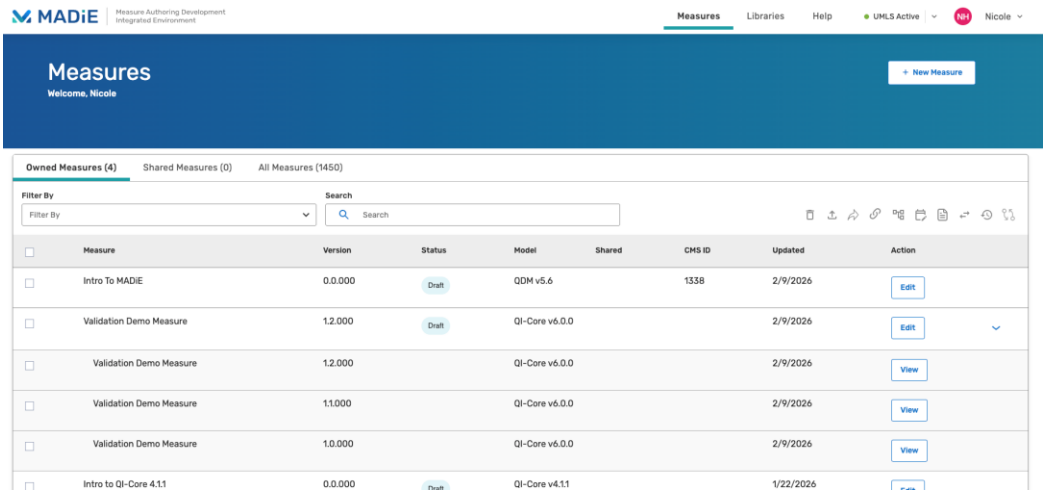


Image: Measure Set Group Expanded

7.1.3 Measure Searching

MADiE provides a flexible and intuitive search interface to help users locate measures quickly and efficiently. At the top of the measure list page, users will first see the Filter By dropdown, which allows them to narrow their search to a specific field: Measure, Version, Model, or CMS ID.

Next to the filter, the search field allows users to enter keywords or identifiers. If no filter is selected, the system will search across all four fields simultaneously. If a filter is applied, the search will only return results based on the selected field. For example, selecting “Model” and entering “QDM” will return only measures that are model type QDM.

When a matching measure is found and it belongs to a measure set, MADiE will return both the most recent draft version of the measure and the specific version that matches the search criteria. This ensures users can view the latest working version alongside the exact match, supporting version comparison and development workflows. Additional measure versions will not display until the search criteria are removed.

Measures within a set that meet the search criteria, are organized in descending version order, with the highest version number appearing first. If a draft version exists, it will automatically appear at the top of the list.

7.2 Versioning a Measure

A Measure in a Draft state can be versioned by selecting "Version" from the "Actions" dropdown. A pop-up will appear where a user can select Major, Minor, or Patch version. The pop-up will also display the current version number, the future version number after versioning is complete, and a text area for the user to confirm the new version number. Users will need to type in the version number, and it will need to match what the tool will be updating the version number to in order to proceed. After typing the version number, click "Continue." MADiE will now attempt to version the Measure. Measures that do not contain valid CQL or Population Criteria cannot be versioned. If the measure cannot be versioned an error message will appear, and the measure will not be versioned. If your measure had invalid Test Cases MADiE will prompt you to ensure you want to version the measure with invalid test cases present. If you select "Yes, Version My Measure," the measure will be versioned with invalid test cases. If you select "No, I want to fix my Test Cases," the measure version action will be canceled. If a measure can be versioned, then clicking "Continue" will take the user back to the Owned or Shared tab where the versioned measure can be viewed.

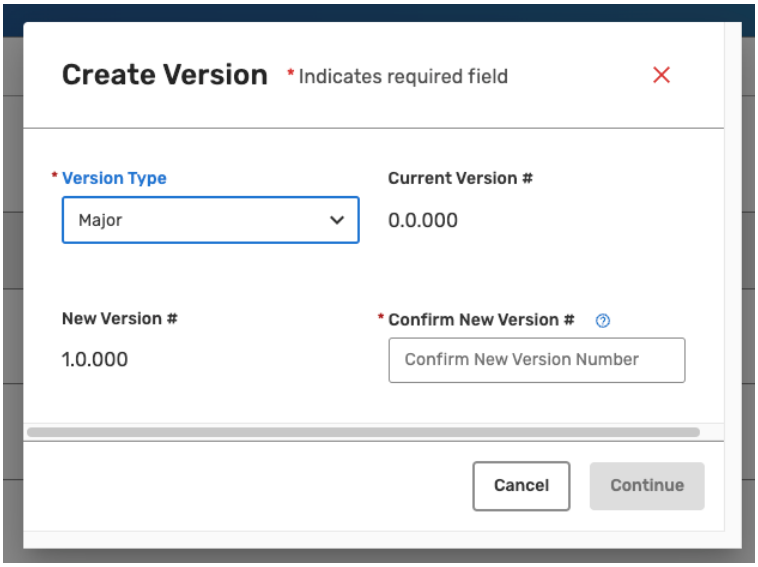


Image: Create Version Modal

After a measure is versioned, the measure Details, CQL, and Population Criteria are locked down and cannot be edited. In addition, the measure exports will be saved in the MADiE database. This means the version of the translator, liquid template (used to generate QI-Core human readable), and MADiE will be preserved in the exports. Should you need to make updates

to a versioned measure or utilize a newer version of the translator or liquid template, draft your measure and re-export. The new draft will allow for measure editing and utilize the most recent versions of all tools.

Though the versioned measures are locked down for editing, the test cases associated with those measures as well as the test case configurations (i.e.. including supplemental data elements, including risk adjustment variables, expansion profile selection, and test case data.) are not. Users can create and delete new test cases, edit existing test cases, import test cases, copy test cases, clone test cases, and update test case configurations on a versioned measure. Test Cases that existed when the measure was versioned cannot be deleted and will be denoted by an icon next to the test case select checkbox. Should a test case be created or edited after the measure was versioned a blue dot indicator will appear next to the Last Saved Date Time. For assistance in creating and editing test cases see Section 9.5. **Note:** Before making changes to test cases on a versioned measure, consider exporting all test cases to preserve a snapshot of the suite at the time of versioning. Once updates are made, it will no longer be possible to export test cases as they existed at the original version point.

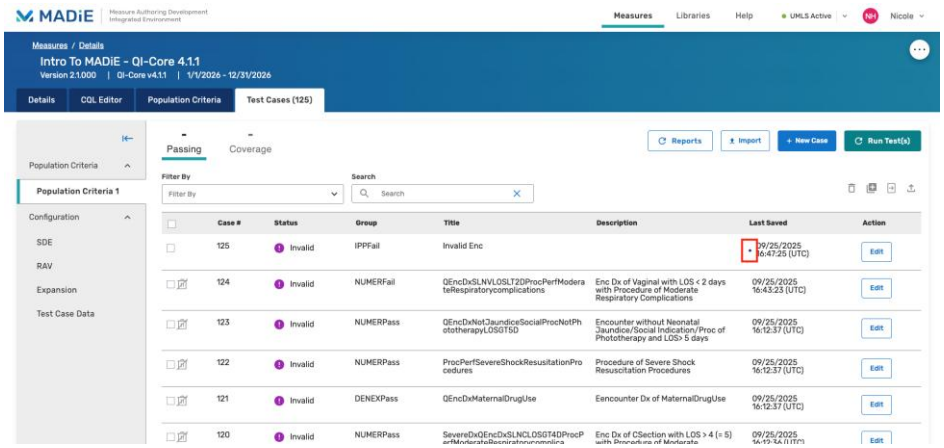


Image: Added or Created Post Version Indicator

Should a user version their measure by accident or select the wrong version type, they can now request the versioned measure be reverted. To achieve this, navigate to the Training & Resources tab on MADIE public website under the MADiE Resources heading and download the file titled "MADiE Revert Measure Version Request Form." Users will need the measure URL, Measure Name, Current Measure Version, Intended Measure Version, Set to Draft Version, and the HARP ID of the measure owner. Once the user fills this form out, they can submit it to the MADiE help desk by emailing to MADiE@cms.hhs.gov.mailto:semanticbits-madie-help@icf.com The help desk will then revert your versioned measure to the draft specified. If the measure owner is trying to revert a measure to a previous version that has already created a draft and made changes, all changes to that draft will be retained. The draft version will be reverted to

the version specified, and then the owner may version to the correct version. **Note**: This draft will not be able to be exported. It will need to be up versioned to restore the ability to export the measure. All measure drafts after that point will be able to be exported.

Note: These request forms MUST be submitted via email and NOT submitted using the MADiE Jira Issue tracker as they contain HARP IDs.

7.3 Draft a Measure

A measure in a versioned state can be versioned if no other versions of that measure are currently in a Draft state. A user can draft a measure by selecting "Draft" from the "Actions" dropdown. A pop-up will appear where a user can change the Measures Name. This field is auto populated to the current versioned Measure Name. Users do not need to change the name; however, Measure Name is required before continuing. Once a user confirms the Measure Name, click "Continue." A draft will now be created, and the user will be directed back to the My Measures tab where the new draft will be visible. From there a user can edit the measure.

For QI-Core measures only, an "Update Model Version" dropdown will also be present. This allows the user to update the QI-Core model version on draft of the measure. See section 11 for more information.

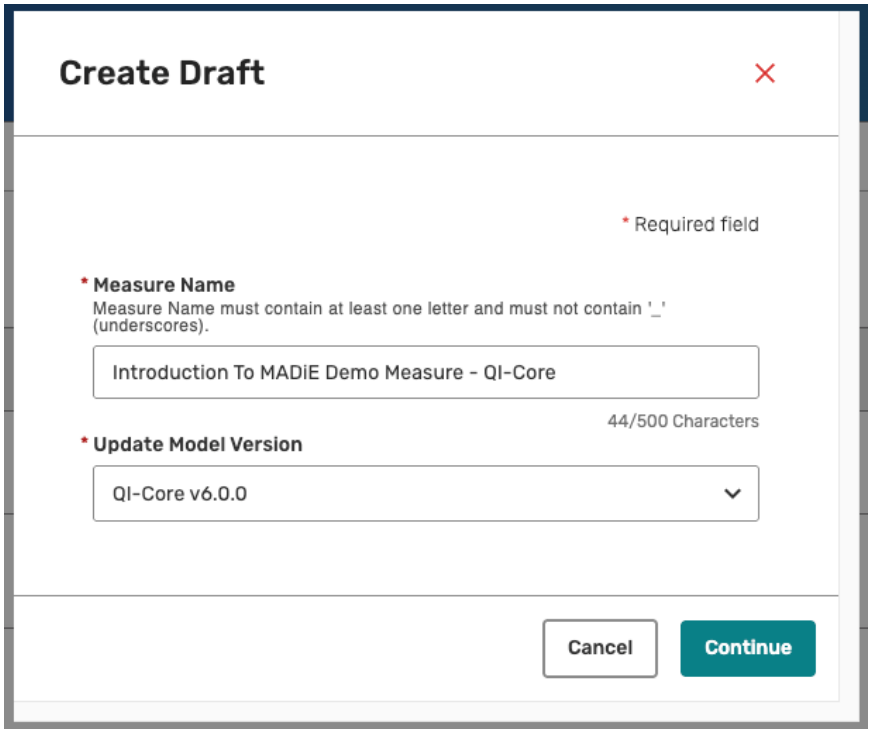


Image: Create Draft Modal

7.4 Associating CMS IDs and Copy Metadata

MADiE allows users to associate a CMS ID from a QDM measure to a QI-Core measure. This will allow users to specify the QI-Core measures are in the same measure family as the QDM measure. Since this feature will primarily be used while converting QDM measures to QI-Core measures, MADiE also allows users to specify if they want to copy metadata from their QDM measure to their QI-Core measure. **Note**: This copy must be done at the same time as the association, users will not be able to go back and programmatically copy the meta data after the association has occurred. If "Copy Metadata" was not checked users can manually copy the meta data at any time.

7.4.1 Associate CMS ID

To associate CMS IDs users must select two measures, one QDM and one QI-Core. The following must be true of the measures:

- The user MUST own both measures
- QDM measure MUST contain a CMS ID
- QI-Core measure must NOT contain a CMS ID
- QI-Core measure must be in draft state

If any of the above conditions are not met, the measures cannot be associated. After selecting two valid measures, users will select the "Associate CMS ID" icon above the measure table. A modal will appear providing the selected measures' name, version, model, and the QDM measure's CMS ID. Use this information to verify the correct measures are selected.

If the selected measures are the correct measures, clicking "Associate" will provide one final confirmation modal. **Note:** Prior to selecting associate, users should check the "Copy QDM Metadata to QI-Core measure" checkbox if the QDM measure metadata should be copied to the QI-Core measure. Refer to section 7.4.2 for additional information. After the checkbox is selected users can continue on with the association. Click "Associate" and the QDM measure's CMS ID will be associated with the QI-Core measure. After association, "FHIR" will be appended to the QI-Core measure's CMS ID. After the CMS ID has been associated, users cannot edit the IDs. Should the CMS IDs have been associated in error please see section 7.4.3 for the steps to take to delete a CMS ID from a measure.

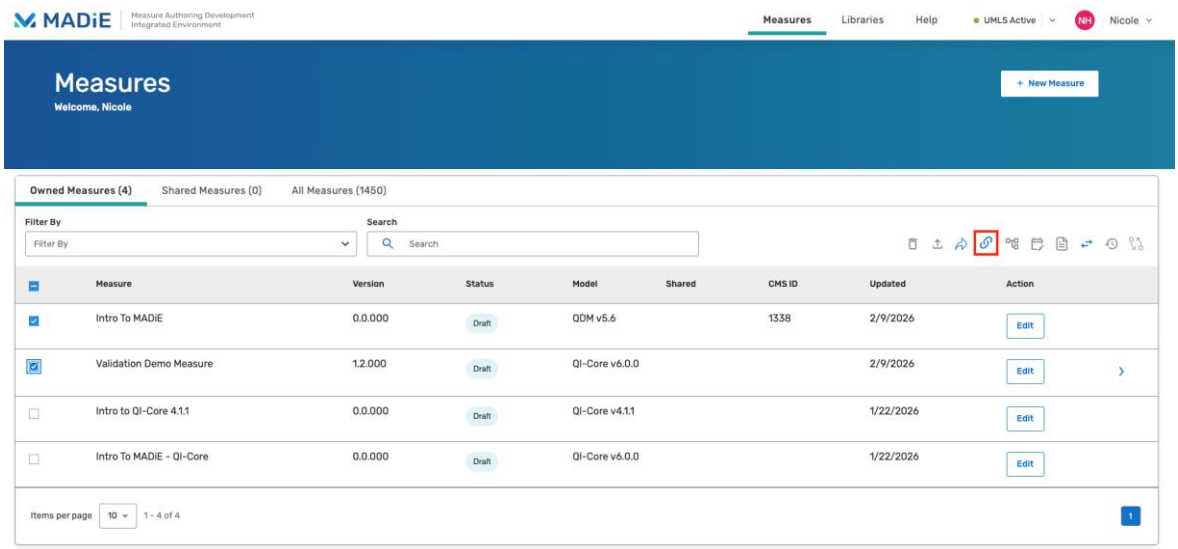


Image: Selecting Measures to Associate CMS ID

7.4.2 Copy Metadata

To copy the QDM metadata data to the QI-Core measure, users should follow steps laid out in section 7.4.1 to associate the id. Prior to selecting associate, check the "Copy QDM Metadata to QI-Core measure." After the checkbox is selected users can continue on with the association. The measure metadata will be copied over to the QI-Core measure.

Important notes:

1. This process must take place on initial association
2. Copying the metadata will overwrite any existing metadata already in the QI-Core measure
3. After copying, the QDM and QI-Core measure will retain their own copy of the data. Updates in one measure model will not impact the other measure model.

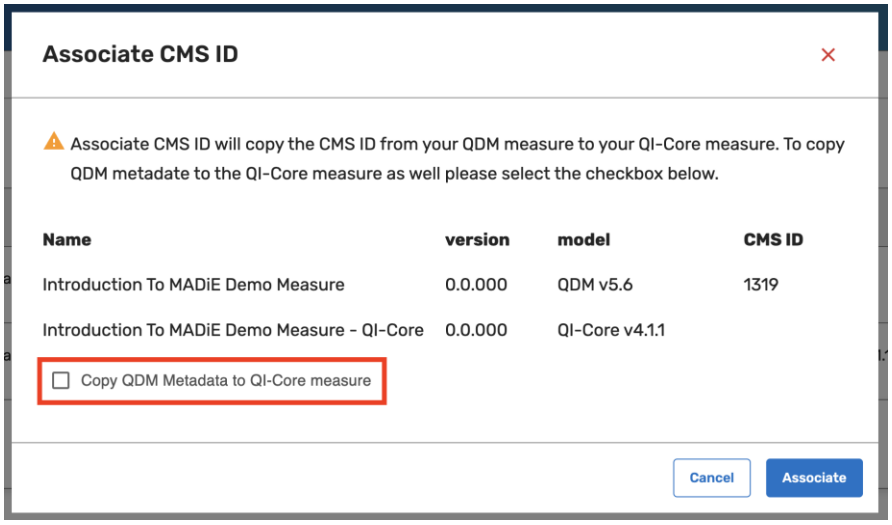


Image: Associate CMS ID Modal

7.4.3 Delete CMS ID

CMS IDs can be deleted from the measure if it was generated in error or linked incorrectly as long as the measure is in a draft state and has never been versioned. To delete the CMS ID the measure owner must fill out the MADiE CMS ID Deletion Request Form file on the Training & Resources tab of the public website. Fill in all the required information:

1. Measure Name
2. Model
3. Measure URL
4. Assigned CMS ID
5. Measure Owner
6. Measure Owner's HARP ID
7. Reason for request

After providing the required information listed above, email the completed form to MADiE@cms.hhs.gov. mailto:madie@cms.hhs.govThis delete action is permanent and cannot be undone.

Note: These request forms MUST be submitted via email and NOT submitted using the MADiE Jira Issue tracker as they contain HARP IDs.

7.5 Measure History

The Measure History feature allows you to view a detailed record of changes made to a measure over time. To access it, select the Measure History icon in the measure action centers. A modal will appear displaying the measure's history. Items in the history will include things like measure

creation details, date created times a measure was versioned or drafted, when a CMS ID was created, other measure updates, etc.

The measure history modal will include the following details:

1. **Date**: This is the date the measure update occurred
2. **User Action:** This will display the type of update that occurred (e.g., CREATED, DRAFTED, CREATE_CMSID)
3. **HarpID:** The HARP ID of the user who performed the action
4. **Additional Info:** Contains any notes related to the update

The modal is paginated for easy navigation through historical entries.

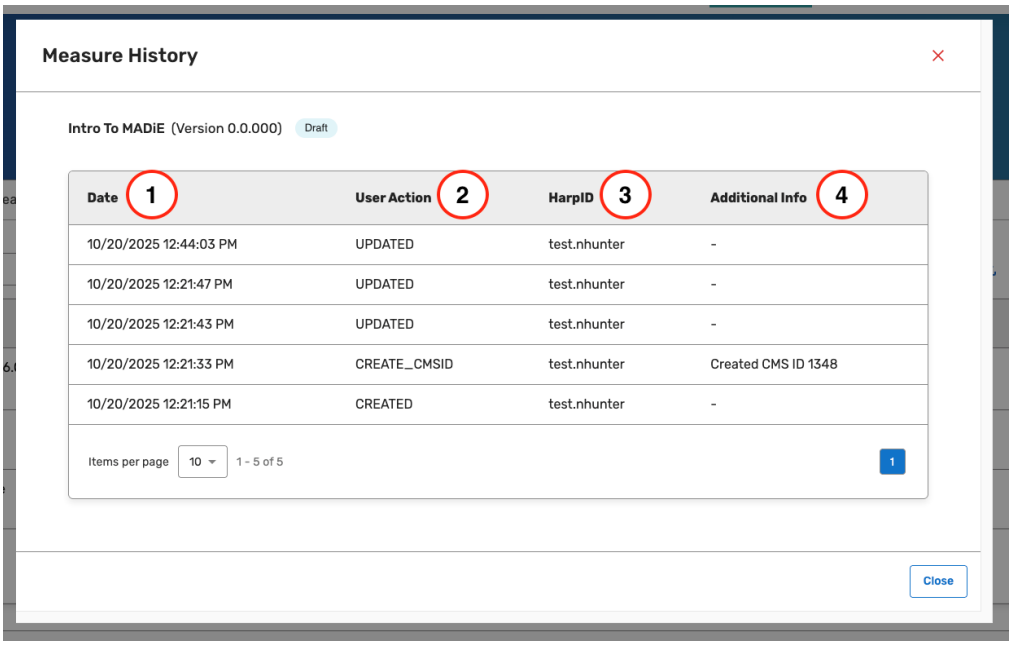


Image: Measure History Modal

7.6 Compare Measure Versions

The Compare Measure Versions feature allows you to easily review the differences between two versions of the same measure directly from the Measure List. You can access it from any tab: Owned Measures, Shared Measures, or All Measures. To begin, select any two versions of a measure and click the Compare Measure Versions icon. This opens a popup window that lets you evaluate version details, CQL changes, Human Readable differences, and measure name updates in one place.

When the comparison popup opens, the header displays the title Compare Measure Versions, followed by the name of the newest of the two selected measure versions. The system identifies the newest version by the measure with the greatest semantic version (major.minor.patch). If one of the

selections is a draft, the draft is always treated as the newest and its name appears at the top. Beneath the name, the system shows the measure's CMS ID. If a measure does not have a CMS ID, a placeholder dash is displayed. Two tabs, CQL and Human Readable, allow you to switch between different types of comparisons, and you may close the window at any time using the Close button.

The CQL tab presents a side-by-side view with an older version on the left and the newer version on the right. If both selected items are versions, the lower version number appears on the left and the higher version number appears on the right. If a draft is selected, the version always appears on the left and the draft on the right. Each side displays the measure's version number (including a draft label when applicable) as well as the last updated date. This tab displays the full CQL code differences side by side so you can clearly see what changed between the two versions. Additions are indicated with a "+" icon at the beginning of the row and highlighted green. Removed CQL is indicated by a "-" icon at the beginning of the row and highlighted red.

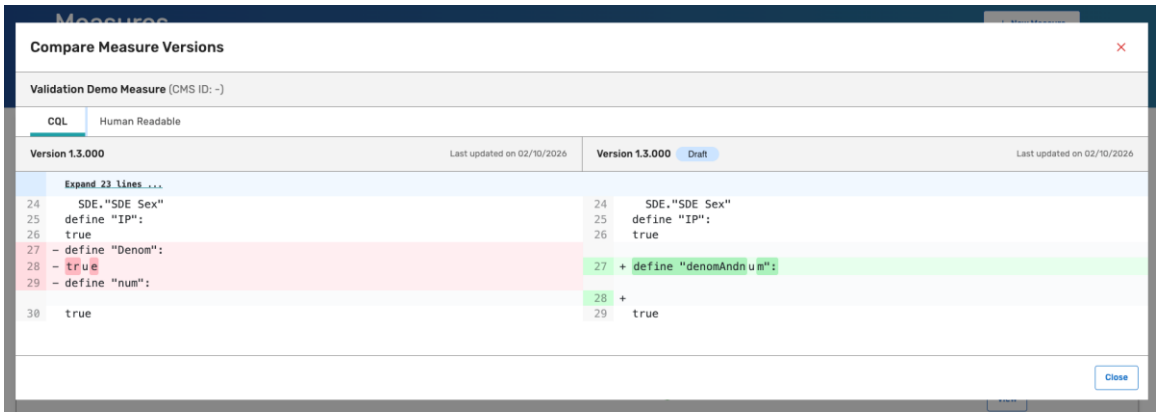


Image: Compare Measure Versions - CQL

The Human Readable tab provides a detailed comparison of the Human Readable files generated for each measure version. Like the CQL tab, the older version of the human readable is displayed on the left and the human readable of the new version or draft on the right. Below the human readable comparisons, a "Differences" header displays how many rows contain changes across the two files. A draggable bar exists between the human readable and the difference table. Users can drag the bar up or down to view more or less of each section. The differences table lists each field that differs, showing the value in the older version on the left and the value in the newer version or draft on the right. Removed content appears in red with strikethrough formatting, and new content is highlighted in green. The order of the fields matches the order found in the Human Readable file itself. If the two files are identical, the interface indicates that there are no differences. If an issue occurs while retrieving the comparison, the table displays a message explaining that the differences could not be retrieved. **Note**: if a draft message is displaying "The human readable file is not available for this measure." it is likely that the human readable is missing measure details required to successfully generate a human readable. Check the measure details and ensure all required values are filled in.

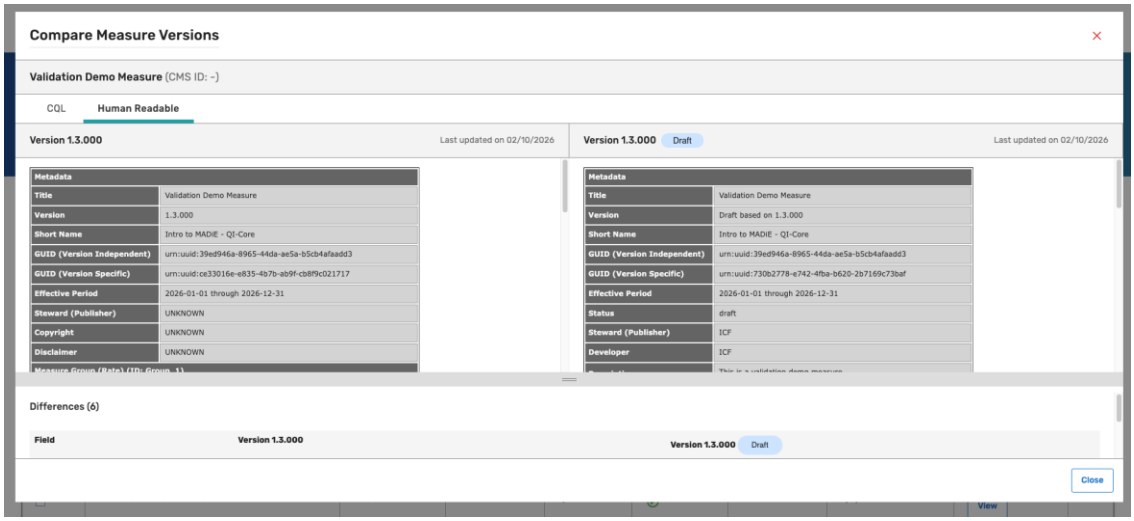


Image: Compare Measure Versions - Human Readable

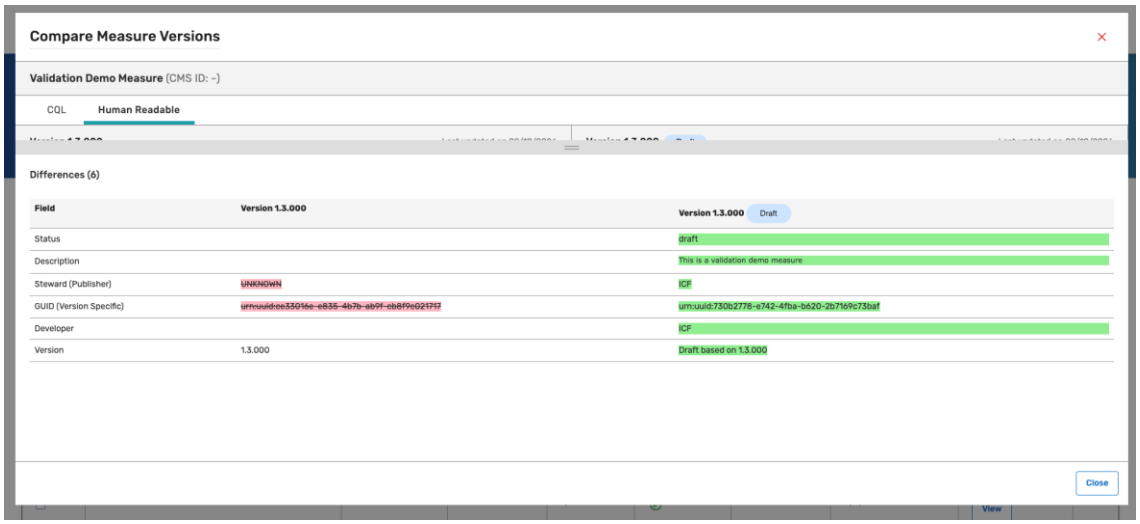


Image: Compare Measure Versions – Human Readable Differences

The comparison popup also highlights changes in the measure's name using the same visual difference formatting. When you have finished reviewing the information, clicking the Close button returns you to the Measure List.

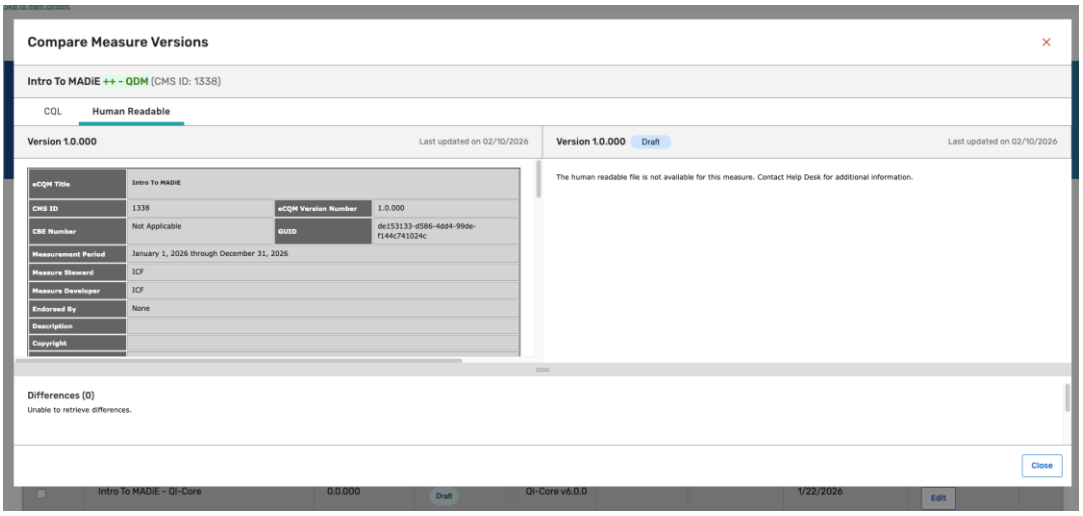


Image: Measure Name Change and Unable to Generate Human Readable

8 Adding Measures in MADiE

MADiE allows users to create new measures in MADiE. Both from scratch and recreating measures that have previously been in MAT.

8.1 Creating a New Measure

To create a new measure in MADiE, initiate the process by clicking on the + New Measure button in the upper right of the screen while on the Measures overview page. The New Measure creation modal will appear, prompting you to enter the following information:

1. **Measure Name:** The Measure Name is used to identify and refer to a measure. It is often descriptive of what the measure assesses.
2. **Measure CQL Library Name:** The Measure CQL Library Name is used to identify and refer to a CQL Library within a measure. When creating the Measure CQL Library Name, it must adhere to the following requirements:
    a. The name must be unique and not match any other CQL Library Name in MADiE.
    b. The first character must be a capitalized letter.
    c. Other valid characters include alphanumeric characters. **Note**: QDM measures will also allow underscores "_". Underscores can't be used in QI-Core measures as they are NOT valid for QI-Core.
    d. Spaces are not allowed.
    e. There must be 64 characters or less.
3. **eCQM Abbreviated Title:** The eCQM Abbreviated Title must be 32 characters or less.

4. **Model:** The Model dropdown displays all available models and model versions that can be assigned to a measure currently supported by MADiE. Currently MADiE supports QI-Core v4.1.1, QI-Core v6.0.0, or QDM v5.6.
5. **Experimental:** Not shown in screen shot below. This checkbox allows user to specify the measure is experimental. This option is only relevant to QI-Core measures, so it will appear after the user selects QI-Core 4.1.1 or QI-Core 6.0.0 from the model dropdown.
6. **Measurement Period - Start Date/End Date:** The Measurement Period - Start Date/End Date fields establish the measurement period for the measure. Start and end dates must be entered in "mm/dd/yyyy" format. **Note**: MADiE will include additional precision when the dates are saved, although this precision will not be visible in MADiE. For example, Start Date is entered as 01/01/2024 MADiE will save the start date as 2024-01-01T00:00:00.000+00:00. Similarly, if the end date is entered as 12/31/2024 MADiE will save it as 2024-12-31T23:59:59.999+00:00. This will allow Measurement period to have additional precision and time zone offset to successfully execute measures.

Once the information above has been entered you have the option to:

1. **Cancel:** The Cancel button discontinues the creation of the new measure and closes the modal.
2. **Continue:** The Continue button saves the initial information entered in the New Measure creation modal and brings the user to the next screen, where the rest of the measure content can be populated.

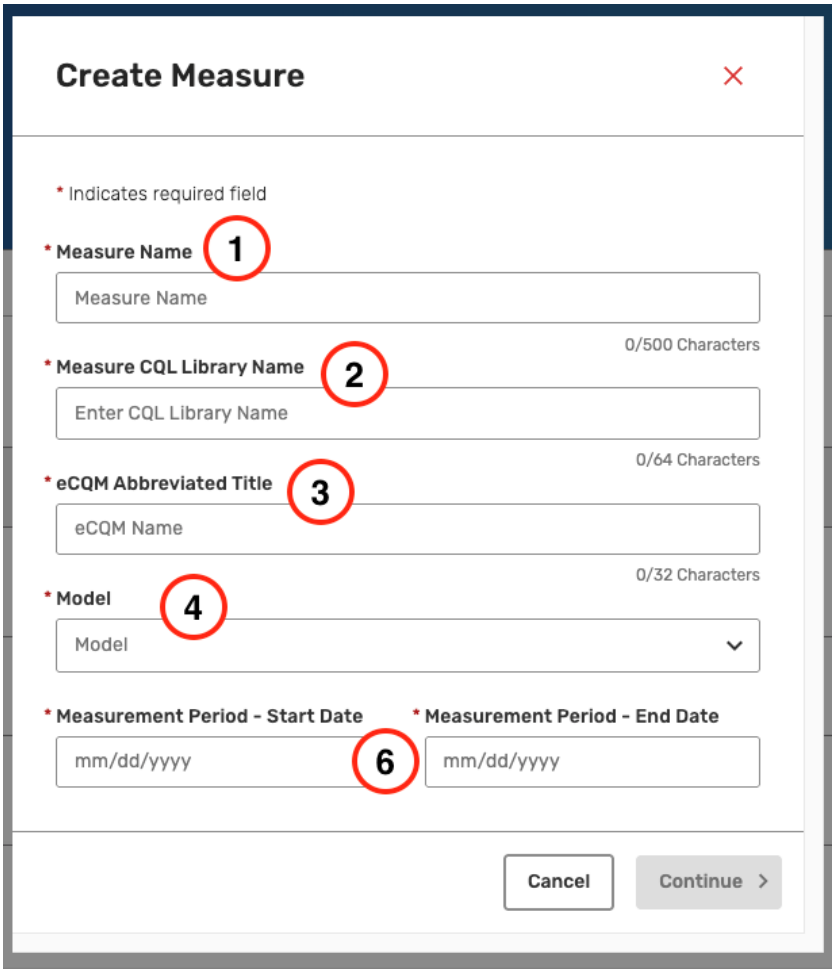


Image: Create Measure Modal

8.1.1 Default CQL

MADiE will generate default CQL and add it to the measures CQL Editor tab on creation of a measure. This consists of required statements in the CQL as well frequently added elements. Should something be added by default your measure does not need, you can navigate to the CQL Editor tab and delete the irrelevant CQL.

8.1.1.1 QDM Default CQL

For QDM measures, the default CQL includes the following:

- Library statement
- Using statement
- MATGlobalCommonFunctionsQDM library
- Value set statements for Ethnicity, ONC Administrative Sex, Payer Type, and Race value sets

- Parameter statement for Measurement Period
- Context statement
- SDE Definitions

8.1.1.2 QI-Core Default CQL

For QI-Core measures, the default CQL includes the following:

- Library statement
- Using statement
- CQMCommon, FHIRHelpers, QICoreCommon and SupplementalDataElements libraries
- CumulativeMedicationDuration libraries (QI-Core v6.0.0 only)
- Parameter statement for Measurement Period
- Context statement
- SDE Definitions

9 Viewing & Editing a Measure

Upon opening an existing measure or continuing from the New Measure creation modal, the measure content viewing/editing area is displayed. The viewing/editing area displays key content and functionality for the opened/newly created measure and additional areas to further view/edit the rest of a measure.

9.1 Measure Header

In the blue header area, the following information and functionality about the measure is displayed:

1. **Measure Name:** The Measure Name field displays the current name of the measure. The Measure Name is typically a brief description of the measure's focus and target population, providing an intuitive way to identify and refer to the measure. The measure name may be truncated if needed to fit the available space followed by ellipses. A tooltip will provide the full measure name if the user mouses over the ellipses.
2. **Measure Version:** The measure version can be found below the measure name
3. **Model Version:** The model and model version can be found below the Measure Name, between the measure version and measurement period.
4. **Measurement Period:** The measurement period can be found under the measure Name and to the right of the model and model version.
5. **Navigation Breadcrumbs:** Above the measure name are navigation breadcrumbs, indicating what area of MADiE is currently displayed and providing a way to navigate back to the measures page.

6. **Measure Actions Center:** On the right side of the blue header area is the Measure Action Center. This is present on all edit measure pages. Users can select an option by clicking the icons in the action center. The available actions are:
    a. **Delete Measure:** Only measures in a draft status may be deleted. Engaging Delete Measure will display a modal confirming if you would like to remove the measure and all its test cases. **Note**: Only the measure owner can delete a measure.
    b. **Export:** Allows a user to attempt to export the measure. After clicking export a dropdown will appear allowing user to select "Export" or "Export for Publishing." If a measure is unable to be exported, an error message will be displayed. For more information on measure exports see section 10.
    c. **Share:** Allows users to share the current measures with different users. See section 12.1.1
    d. **Version or Draft**: Allows users to version or draft a measure based on the user's access and. For information on how to version or draft a measure see sections 7.2 and section 7.3 respectively. The screen shot (below) depicting the action center shows the version icon, as the measure is currently in a draft status. If the measure is in a versioned status the icon would be different as it indicates the user can draft that measure.
    e. **View Measure History**: This icon allows users to see information about the measure history. See section 7.5.
    f. **View Human Readable:** This allows users to view the Human Readable in a pop-up in MADiE. The measure CQL must not contain errors, and the population criteria must be set up before the View Human Readable action will be enabled. If you get an error stating the Human Readable is not available for this measure, verify those elements are valid and try again. From the view human readable modal users can also export the measure. Scroll to the bottom of the modal and an "Export" button is present. Clicking this will export the measure for the user. **Note**: This is the full measure export, not just the Human Readable file. For more information on exporting measures see section 10.
    g. **Transfer Measure:** Allows users to transfer the selected measure or measures to another MADiE User. See section 12.3.1 for more details.

Image: Measure Header

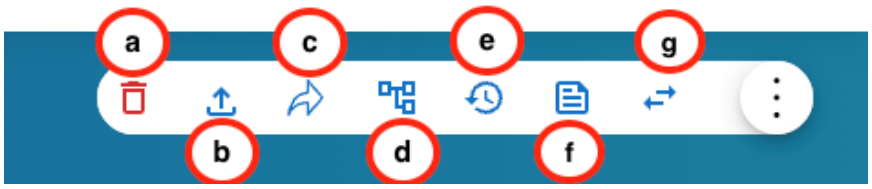


Image: Measure Action Center

9.2 Details Tab

The Details tab is displayed upon opening an existing measure. and consists of many subareas, described below. Each tab displays a completion indicator. A red circle with an exclamation mark means required data is missing in the corresponding section. A green circle with a check mark indicates all required fields are complete. The absence of a completion indicator means no data has been added to the optional section.

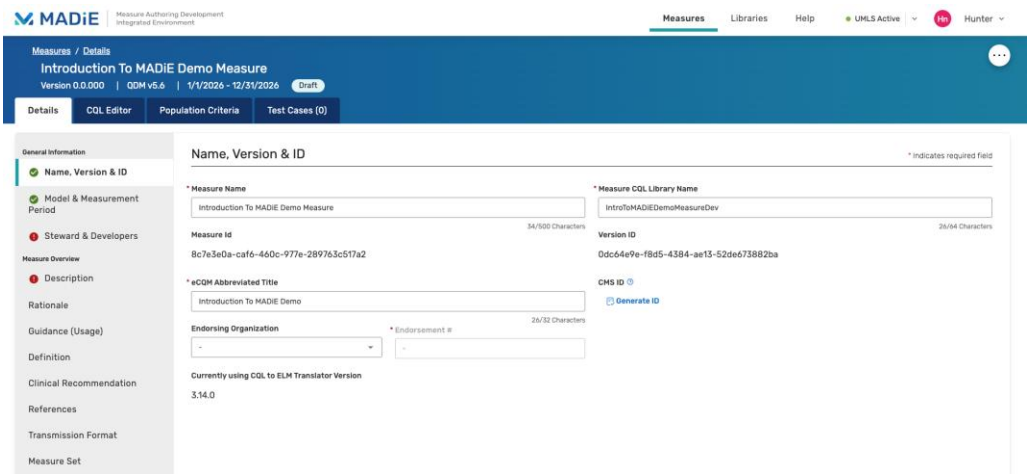


Image: Measure Details Tab

9.2.1 General Information

The Information subarea of the Details tab contains mostly identifying information related to a measure. Content in this subarea includes:

9.2.1.1 Name, Version, & ID

1. **Measure Name:** The Measure Name field displays the current name of the measure. The Measure Name is typically a brief description of the measure's focus and target population, providing an intuitive way to identify and refer to the measure. The measure name can be edited here.

2. **Measure CQL Library Name:** The Measure CQL Library Name field displays the current name of measure CQL library within the measure. Users often specify a name similar to that of the measure Name. The library name can be updated here. **Note**: This field must be 64 characters or less.
3. **Measure ID:** The Measure ID provides a unique identifier to reference the measure from which its versions and drafts originated. It is shared between all versions and drafts of the same measure, but unique between different measures. The Measure ID cannot be edited and is automatically generated by MADiE. If your measure was transferred from the MAT, the measure ID was retained.
4. **Version ID:** The Version ID provides a unique identifier to reference a specific version of a measure. Every time a new version of a measure is created, a new, unique identifier is assigned. The Version ID cannot be edited and is automatically generated by MADiE.
5. **eCQM Abbreviated Title:** The eCQM Abbreviated Title is a shorter name used to identify the measure. It can be edited here and must be 32 characters or less.
6. **CMS ID:** The CMS ID, also called the eCQM Identifier, is an assigned number unique to the versions and drafts of the measure. It will not be assigned to any other measure. The use of this field is optional. To assign a CMS ID, verify you are the measure owner, then select the blue 'Generate Identifier' link, you will be asked to confirm generation is wanted. FHIR CMS IDs will be appended with the term FHIR. If a measure was transferred from the MAT, the CMS ID was retained. Once a CMS ID has been generated, you will not be able to modify or remove it from any draft or version of that measure in the UI. If your CMS ID was generated in error, you can request it be removed from your measure. To do this, ensure there are no versions of your measure, fill out the MADiE CMS ID Deletion Request Form, found on the MADiE public website, then submit the completed form via email to MADiE@cms.hhs.gov. mailto:

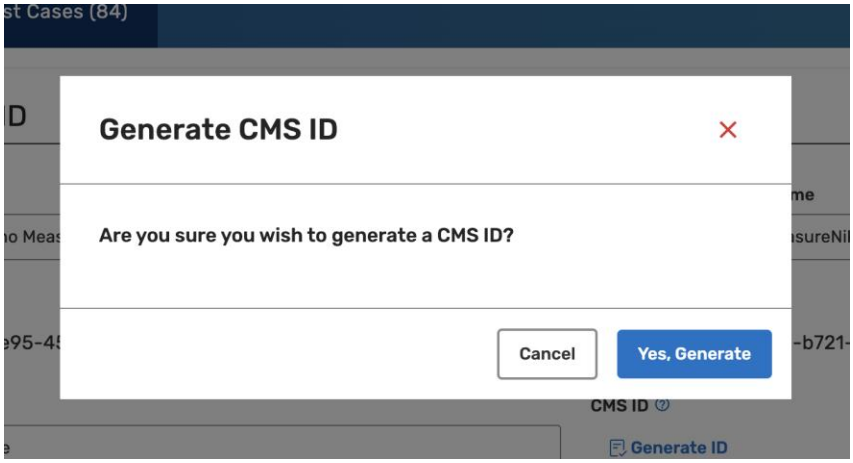


Image: Generate CMS ID Confirmation Modal

7. **Experimental:** The 'Experimental' field defaults to "No" for new measures, indicated by an unchecked checkbox. To specify if the measure is experimental, check the checkbox.
8. **Endorsing Organization:** The Endorsing Organization consists of two fields. The first field is used to select the organization that endorses the measures, and the second field is used to enter the endorsing number. Endorsing Organization is not required. If no Endorsing Organization is selected, then the Endorsing Number must be blank. If an Endorsing Organization is selected, an Endorsing Number is required.
9. **CQL to ELM Translator Version**: The CQL to ELM Translator Version used to translate the measure is displayed here. If the measure is in a draft status, the text will say "Currently using CQL to ELM Translator Version" with the current translator version for the measure model displayed. If the measure is in a versioned status, the text will read "Versioned with CQL to ELM Translator Version" and the version MADiE was using when the measure was version. All exports will align to that version.
10. **Intended Venue (QI-Core Only):** The Intended Venue is where users can specify which venue the measure is relevant for. This is a dropdown where users can select Eligible Clinician (EC) or Eligible Hospital (EH).

9.2.1.2 Model & Measurement Period

1. **Model:** The model field indicates the model used to create the measure. Currently QI-Core v4.1.1, QI-Core v6.0.0 and QDM v5.6 are the only supported models. After the measure is generated, the model cannot be changed.
2. **Measurement Period - Start Date/End Date:** The Measurement Period - Start Date/End Date fields establish the measurement period for a measure. **Note:** MADiE will include additional precision when the dates are saved, although this precision will not be visible in MADiE. For example, Start Date is entered as 01/01/2024 MADiE will save the start date as 2024-01-01T00:00:00.000+00:00. Similarly, if the end date is entered as 12/31/2024 MADiE will save it as 2024-12-31T23:59:59.999+00:00. This will allow Measurement period to have additional precision and time zone offset to successfully execute measures.

9.2.1.3 Steward & Developers

The Steward & Developers subarea indicates those organizations responsible for maintaining and contributing to the measure. Content in this subarea includes:

1. **Steward:** The Steward dropdown allows selection of the organization responsible for a measure's content and maintenance. The Steward is also commonly referred to as the measure publisher. This field is required to export a measure. Only one organization can be selected

2. **Developers:** The Developers dropdown allows selection of the organization(s) that is/are responsible for authoring a measure. Choose the desired organization(s) from the dropdown menu. This field is required to export a measure.

Note: Organizations not included in the Steward/Developers dropdowns can be added by making a request to the MADiE Helpdesk.

9.2.2 Measure Overview

9.2.2.1 Description

The Description subarea communicates the measure intent. Examples of Description content is available in the human readable files of published measures within the eCQI Resources Center.

9.2.2.2 Rationale

The Rationale subarea describes why a measure is needed and includes content related to important criteria such as impact, gaps in care and evidence. Example Rationale content is available in the human readable files of published measures within the eCQI Resource Center.

9.2.2.3 Purpose

The Purpose subarea is where the measure developer should specify why this measure is needed and why it has been designed as it has. This should be a clear description of the purpose of the measure.

9.2.2.4 Guidance (Usage)

The Guidance (Usage) subarea describes how to interpret or implement certain components of a measure. Implementers can reference Guidance (Usage) for additional information about the measure's data elements, logic, and timing. If Guidance (Usage) information is not being included for a measure, enter "None" into this field.

9.2.2.5 Definition

Enter a definition or description of individual terms, if needed. For QDM measures this field is a free text area. For QDM measures that do not have definition information, enter "None" into this field.

QI-Core measures have a more robust Definition tab, allowing users to enter a list of terms and their definitions. To add a term, users should click "+Add Term" in the upper right-hand corner. A modal will be displayed, allowing users to enter a term and the terms definition, which are both required. Users can then click "Save" and the definition will be added to the definitions list

in alphabetical order by Term. Users can add as few or as many definitions as the measure needs. The table is paginated, allowing users to select the number of items they wish to see in the table.

Should a definition be entered in error, a user can delete the definition by selecting the trashcan icon in the row of the incorrect definition. Should the definition need to be updated, the user can select the edit icon in the definition's row. This will open a modal with the term and definition for the user to edit. Clicking "Discard Changes" will close the modal without updating either field. Clicking "Save" will update the users term and definition.
Users can also search for a specific term or definition in the search bar. Users should enter their search term in the search box and click "Enter" or click the magnifying glass. MADiE will then perform a search for any term or definition that contains the word(s) entered in the search box. After the search is completed only relevant definitions will be displayed. To clear the search users should click the "X" in the search box and the complete list of definitions will again be displayed.

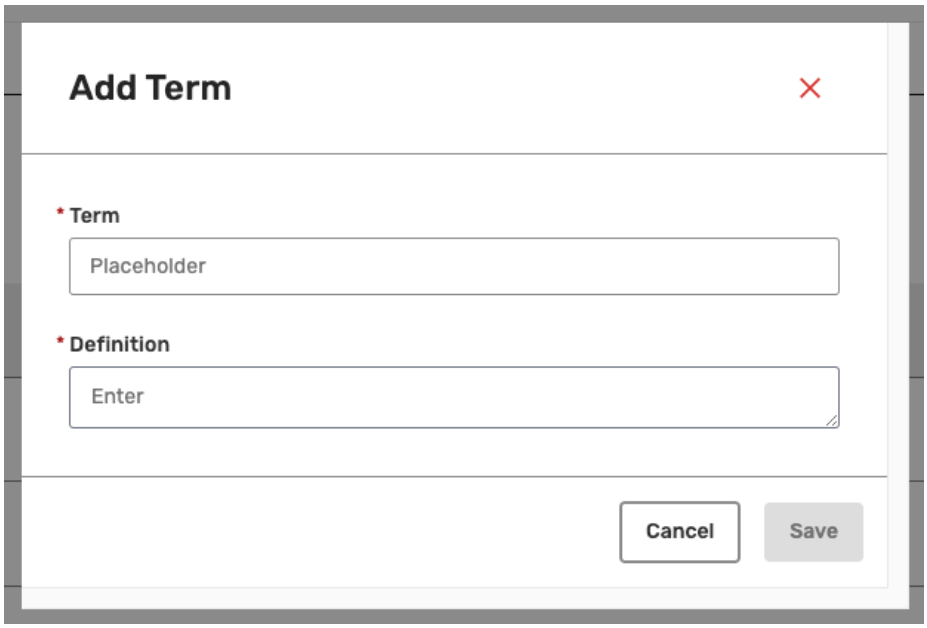


Image: QI-Core Add Definition Modal

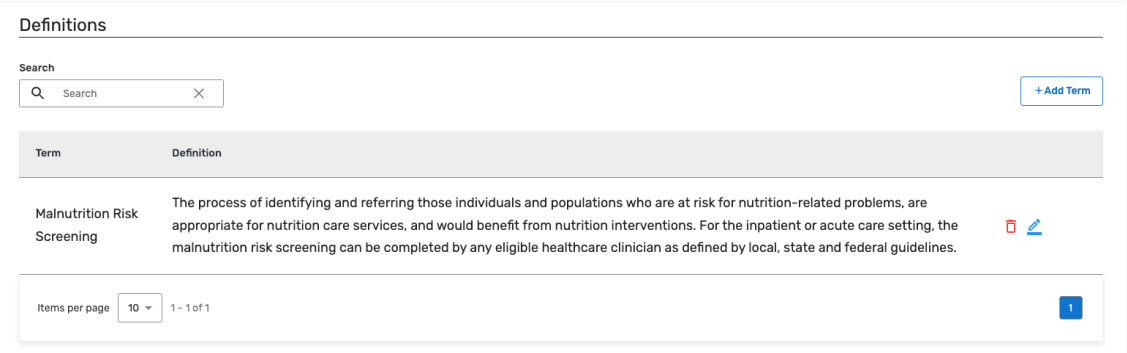


Image: QI-Core Definition Tab

9.2.2.6 Clinical Recommendation

The Clinical Recommendation subarea includes a clinical recommendation statement or general advice regarding the measure and its content from the expert panel that created the measure. The clinical recommendation statement is a summary of relevant clinical guidelines or recommendations supporting the measure.

9.2.2.7 References

Enter information that identifies bibliographic citations or references to clinical practice guidelines, sources of evidence or other relevant materials supporting the measure's intent and rationale. To add a reference, click the "+ Add Reference" button. A modal will be displayed. Select the reference type and then enter the reference text. Clicking "Save" will add the reference to the reference table. Users can continue adding references until all have been entered. The reference table will sort alphabetically, first by type and then by reference text.

To edit a reference, click the dropdown "Edit" icon on the reference to be edited. A modal will be displayed allowing users to update the reference information. Clicking "Save" will update the reference and reorder the references alphabetically.

To Delete a reference, click the dropdown "Delete" icon on the reference to be deleted. A confirmation dialogue is shown. Click "Cancel" to continue without deleting the reference and click "Yes, Delete" to permanently delete the reference from the measure.

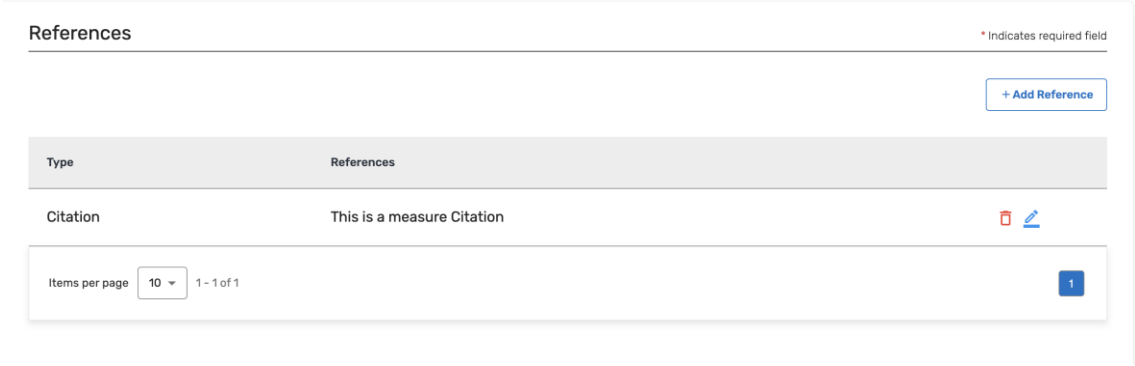


Image: Added Reference Table

9.2.2.8 Transmission Format (QDM Only)

The Transmission Format subarea allows users to enter URLs that provide the transmission formats that are specified for a reporting program. For measures that do not have transmission format information enter “None” into this field.

9.2.2.9 Measure Set (QDM Only)

A measure set is a unique grouping of measures that, when viewed together, provide a robust picture of the care within a given domain (e.g., cardiovascular care, pregnancy). For measures that do not have a measure set, enter “None” into this field.

9.2.3 Legal

9.2.3.1 Copyright

The Copyright subarea includes the organization(s) who own the intellectual property represented by the measure. For measures that do not have copyright information, enter “None” into this field.

9.2.3.2 Disclaimer

The Disclaimer subarea includes disclaimer information for a measure. For measures that do not have disclaimer information, enter “None” into this field.

9.2.4 Rich Text Editors

The Rich Text Editor in MADiE is designed to help users create clear, well-formatted content with ease whether you're documenting measure details or adding descriptions. This editor offers a familiar, intuitive interface that supports essential formatting tools to keep your work organized and professional. The editor allows you to:

1. Undo and Redo – Quickly reverse or repeat your last actions to streamline editing.

2. Text Styling – Apply bold, italic, underline, or strikethrough to emphasize key points or clarify content.
3. Lists – Use numbered (ordered) or bulleted (unordered) lists to structure information clearly.
4. Insert Table – Add tables to organize data in rows and columns. Ideal for presenting structured information like value sets, logic breakdowns, or comparison matrices.

Simply click into the editor field and begin typing. Use the toolbar at the top to apply formatting as needed. Whether you're working on measure metadata or collaborative documentation, the Rich Text Editor ensures your content in MADiE is both readable and consistent.

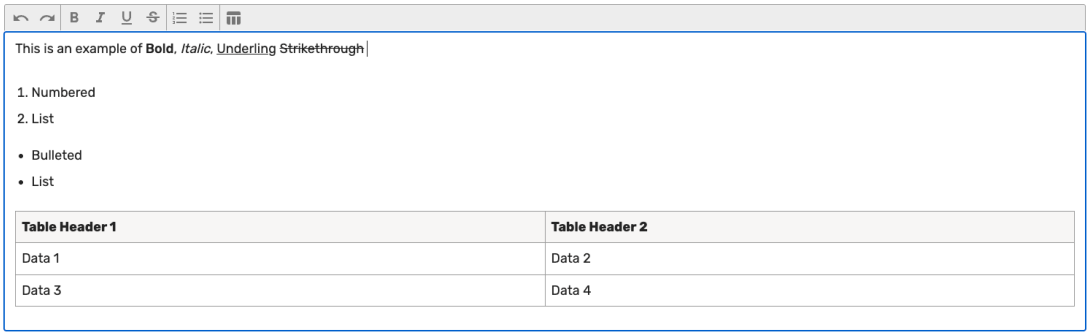


Image: Rich Text Editor Example

All formatting applied in the editor will carry through to MADiE Exports, ensuring your documentation remains clean, consistent, and easy to read across platforms. This includes the human readable and resource files in the other exports.

9.3 CQL Editor Tab

MADiE's CQL Editor tab is a split screen tab. The left half allows the users to edit the CQL directly by typing into an editor. The right-hand side displays screens where the user can search for and apply codes and value sets to the CQL.

Users wanting to edit in the CQL directly can select the bar dividing the two sides and drag it to the right. This will shrink the search and apply side. Users wanting to focus on searching for and applying codes or value sets can drag the divider to the left shrinking and even hiding the measure CQL. The value sets and code tabs are defaulted to closed; however, users can drag or select the arrow to access the tabs.

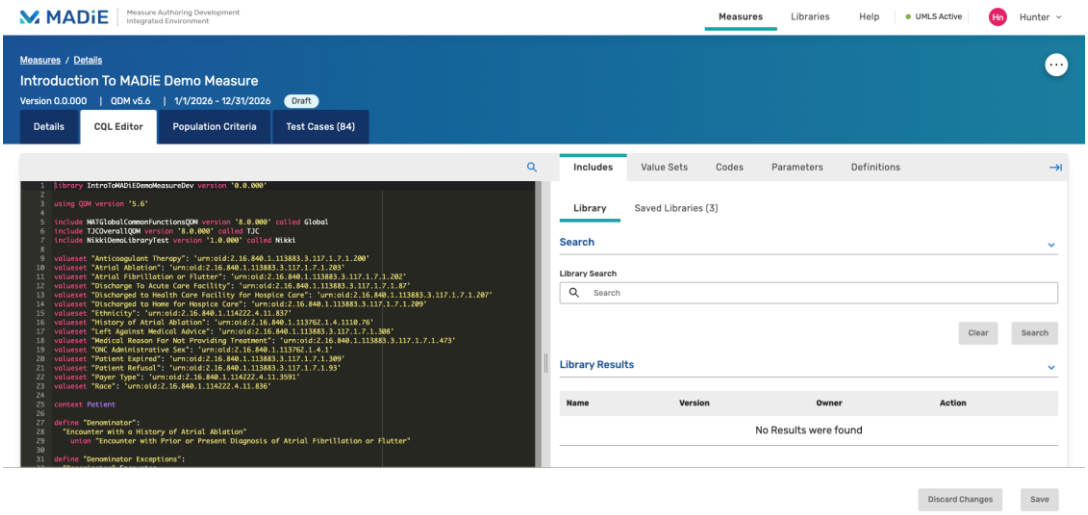


Image: CQL Editor Tab

9.3.1 CQL Editor

A measure's CQL, including Parameters, Definitions, and Functions can be viewed and edited in the CQL Editor tab (second tab from the left, next to Details, after opening a measure). All information except for the measure CQL Library Name and Version can be added, edited, and deleted.

All CQL must be entered in correct CQL syntax. When saving, any errors in the CQL will be displayed. CQL containing errors can be saved but may prevent dependent functionality from working properly (e.g., population criteria configuration, test case calculation, etc.). Make sure that the CQL is fully completed, and errors are resolved to ensure proper functionality of areas dependent on the CQL.

MADiE will validate that the CQL Using statement matches the value selected when the measure was created. If the Measure was created as a QDM measure the using statement must specify "Using QDM." If the measure was created as a QI-Core measure the using statement must specify "Using FHIR" or "Using QI-Core." If the CQL does not contain the correct using statement MADiE will overwrite the value. If the using statement is missing completely MADiE will provide an error message prompting one to be added.

9.3.2 Find and Replace

The CQL Editor tab allows users to find specific phrases in the CQL by clicking the search icon or ensuring your curser is in the Editor and press Ctrl+F or Cmd+F on the keyboard to open the Find & Replace window. Users can type a string in the Find text area and the editor will find all

locations of the test. Use the arrow keys to navigate forward and backward between the elements. Clicking “All” will highlight all instances of the text.

If users wish to replace text, use the find function to find the text to replace. Then type in the replacement text in the “Replace with” text area. Clicking “Replace” will replace the current highlighted text and highlight the next instance of the word. Selecting “All” will replace every instance of the find text in the CQL. If the replace field is not shown in the pop-up, simply click the Plus button below the find text area and it will appear.

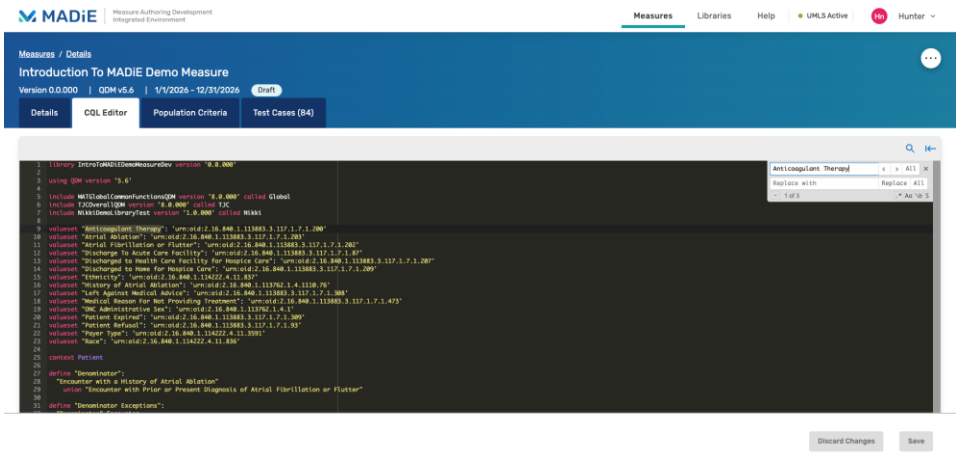


Image: Find and Replace Feature

The find feature also has extra features to help the user refine their search. The additional features include:

1. **RegExp Search**: Allows the user to use regular expression to search in the editor
2. **Case Sensitive Search**: the search takes the case of the word into account. The find defaults to being case insensitive
3. **Whole Word Search**: Searches on the whole word entered and does not look for partial match
4. **Search in Selection**: Searches in the visible section of the screen

Users can select one or more of these options to help refine their search.

Note: This find and replace functionality is available in standalone CQL libraries, CQL Editor and in the Measure creation CQL Editor.

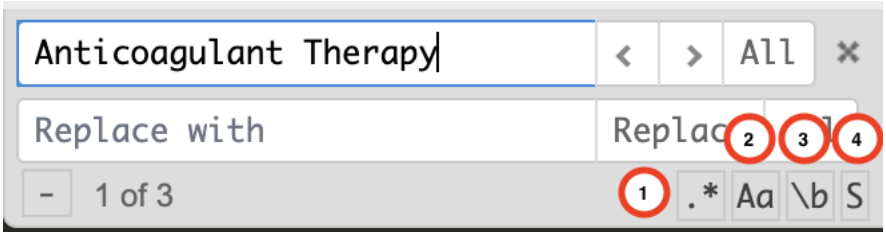


Image: Find and Replace Close up

9.3.3 Includes Builder

MADiE allows users to search, view, and apply included libraries to the measure CQL by using an "Includes" builder. Users can also edit existing included libraries to update an alias or version number.

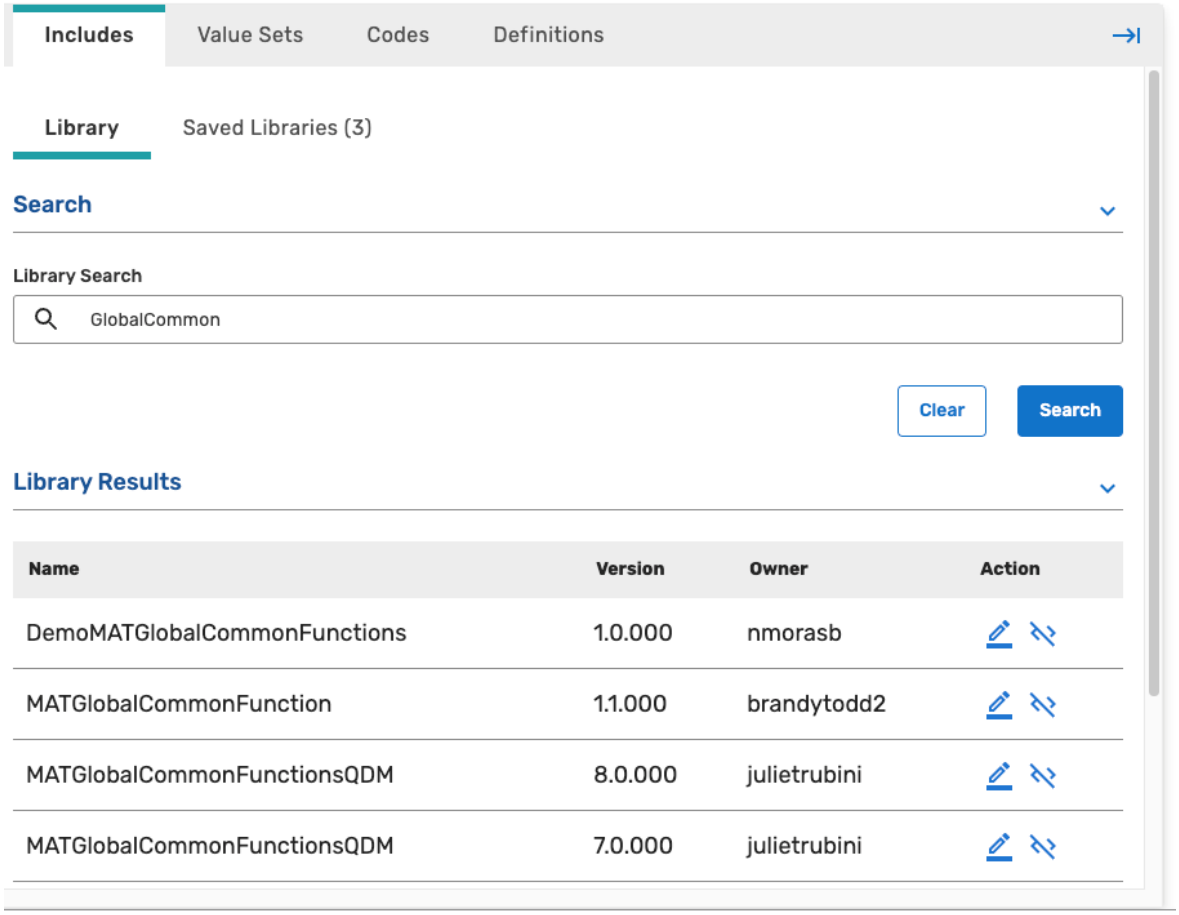


Image: Includes Builder Tab

9.3.3.1 Library Tab

This tab allows users to search for standalone CQL Libraries. To perform a search, users will enter a search term in the search field and click "Search." Any versioned library that contains that text will be returned in the Library Results section.

The Library Results table contains the following data

1. **Library Name**: Displays the library's full name
2. **Version**: Displays the version of the library. **Note**: All versions of that library will be returned in the search. Users should ensure they select the version they want to use.
3. **Owner**: Displays the library owner. Since libraries can have similar names, this allows users to ensure they are selecting the correct library
4. **Action Center:**
    a. **Edit**: Opens a modal allowing the user to view the CQL, library name, and library owner. Users may also enter the Alias, select the version, and apply the library to the measure CQL.
    b. **View**: Opens a modal allowing the user to view the CQL, library name, and library owner.

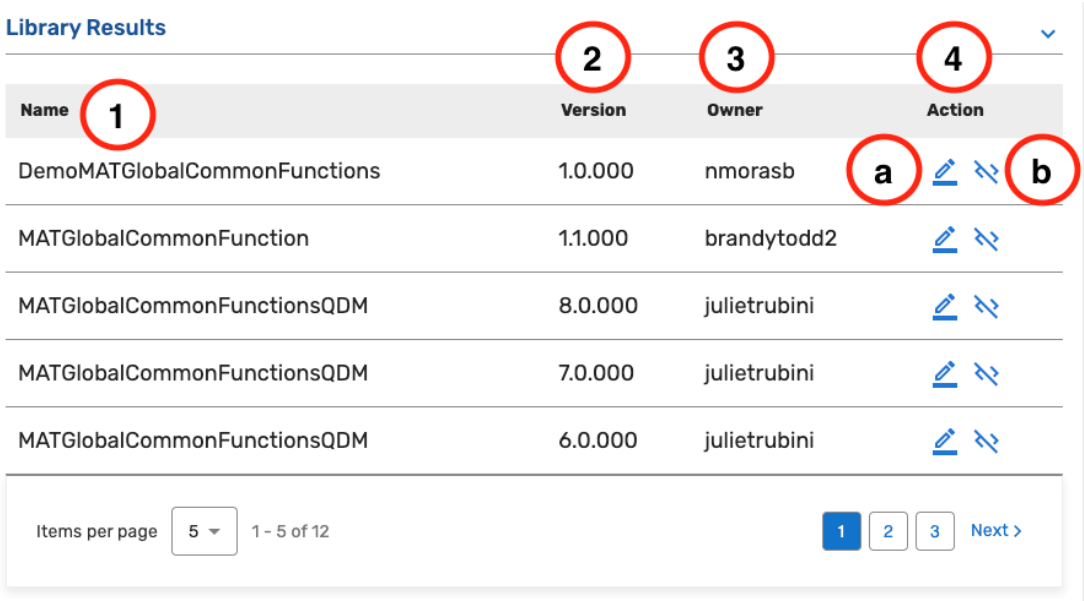


Image: Library Results Table

To add an included library to the measure, select "Edit" from the action column. Once the edit modal opens, ensure the library is the correct library by verifying the name and owner. Users will then enter the alias your included library will have followed by selecting the version you want to include from the version dropdown. Finally, select "Apply." MADiE will then add an include statement for that library to the measure CQL.

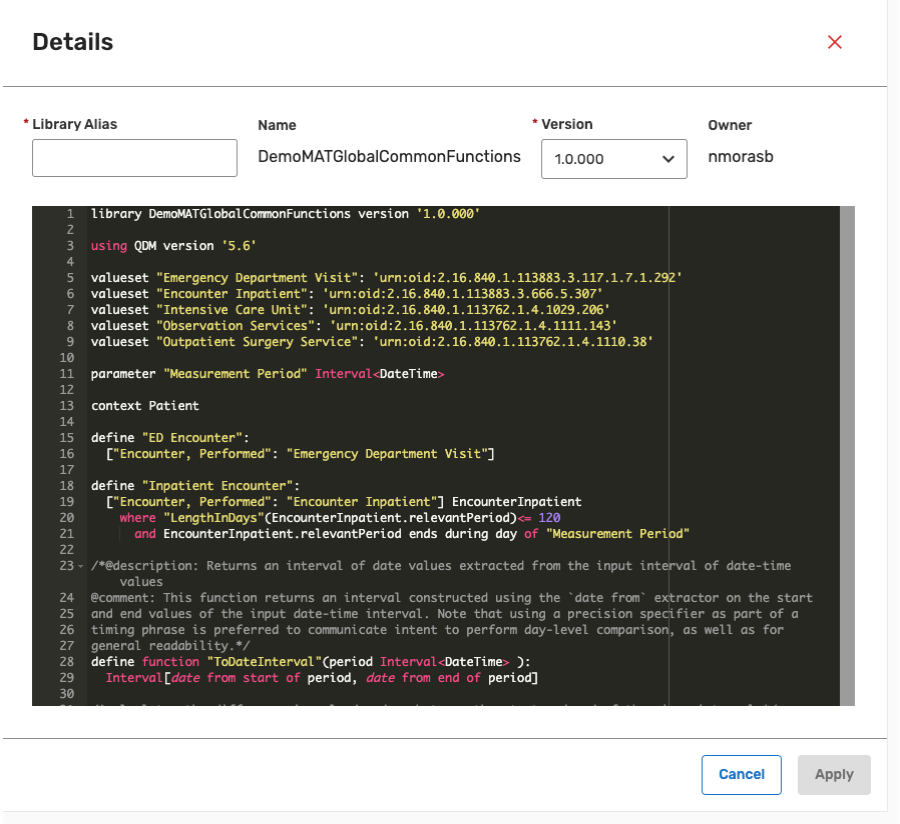


Image: Edit Included Library Modal

9.3.3.2 Saved Libraries Tab

This tab allows the user to view any included libraries that have already been applied to the measure, either by using the included library builder or manually typing the statement.

The tab shows a table with the following information:

1. **Alias**: Displays the alias the user selected to reference the library in their CQL
2. **Name**: Displays the library's full name
3. **Version**: Displays the version of the library. **Note**: All versions of that library will be returned in the search. Users should ensure they select the version they want to use.
4. **Owner**: Displays the library owner. Since libraries can have similar names, this allows users to ensure they are selecting the correct library
5. **Action Center**:
    a. **Delete**: Allows users to delete the included library
    b. **Edit**: Allows users to edit the alias or the version of the library included. **Note**: Updating the Alias will result in errors in the measure CQL until all references to the old alias have been updated to the new alias.
    c. **View**: Allows user to view the alias, name, version, owner, and CQL

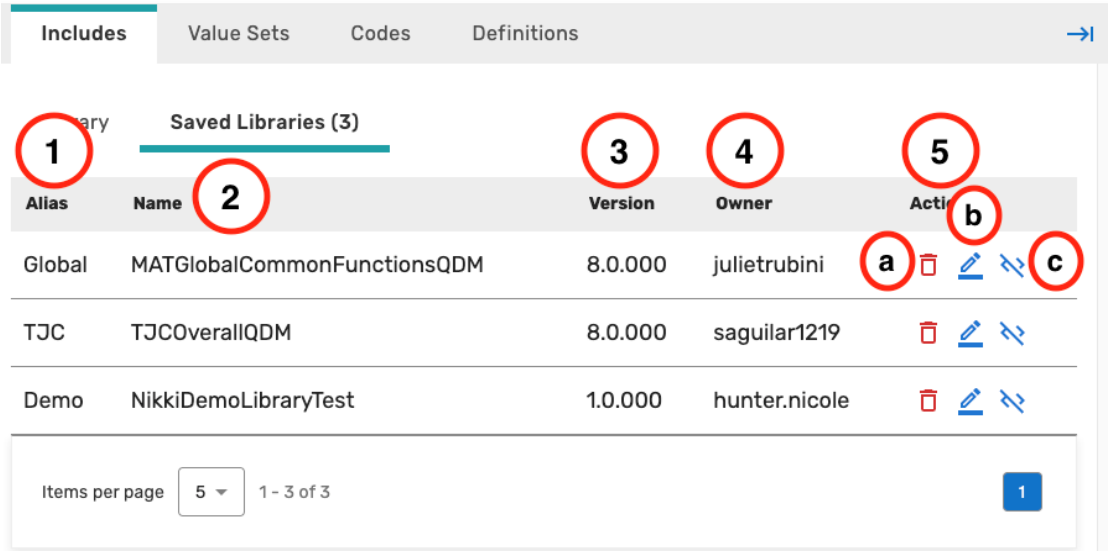


Image: Saved Libraries Tab

9.3.4 Value Set Search and Apply

MADiE allows users to search, filter and apply value sets to the measure CQL on the measure CQL Editor tab. To do this select the "Value Sets" tab on the right-hand side of the editor window. Three expandable sections will be present:

1. Search
2. Filter
3. Results

The search section will be expanded by default.

9.3.4.1 Value Set Search Section

A dropdown will be present to search by different categories. Users can select one to many of the following categories to help locate a value set

1. **Code** – Returns any value set with the given code
2. **Definition Version** – Can only be used with the OID/URL. Users must select both options to be able to search by definition version. This returns the value set matching the selected version
3. **Description** – Returns any value set matching the search description
4. **Keyword** – Returns any value set that has a value set-keyword extension matching the given keyword
5. **Name** – Returns any value set matching the name
6. **OID/URL** – Returns all versions of the value set matching that URL or OID
7. **Status** – Returns value sets that match the given status
8. **Title** – Returns any value set matching the title

For each category, the user selects a text area that will populate on the screen for the user to enter their search criteria. After the user enters their desired search criteria, the search button will become enabled. Clicking the search button will use APIs to connect to VSAC and return a list of value sets that meet the search criteria. The results will return in the Results sub section.

Important: These searches are done on a "starts with" match which means the value set you are searching for must start with your search criteria. For example, if your value set name is AnticoagulantTherapy a search for "Therapy" will not return your value set. A search for "Anticoagulant" will return your value set and others that start with the text "Anticoagulant."

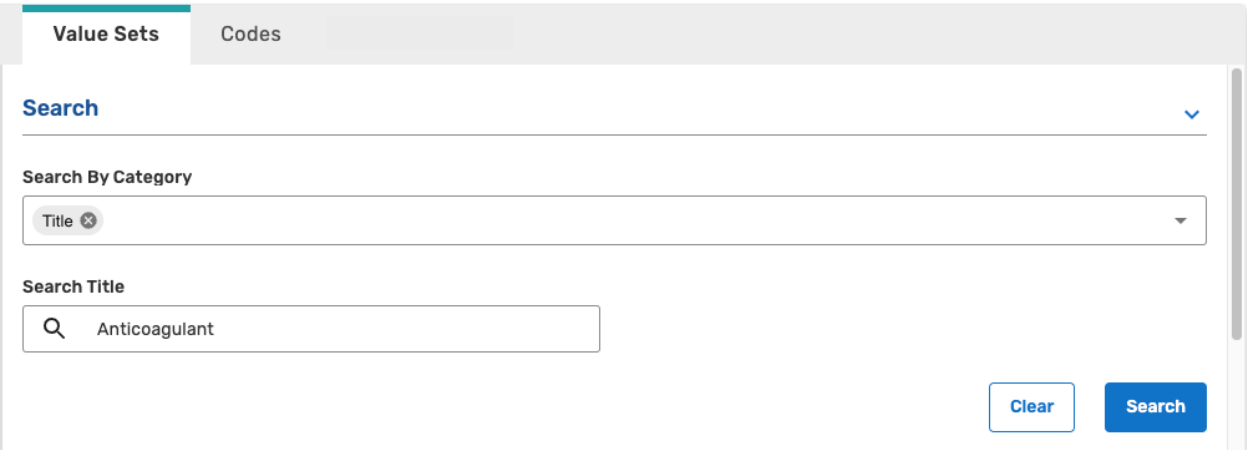


Image: Value Set Search for Title Starts With "Anticoagulant"

9.3.4.2 Filter Section

Users also have the ability to filter their search results by one or more of the following categories

1. Author
2. Composed Of
3. Definition Version
4. Effective Date
5. Last Review Date
6. Last Updated
7. OID/URL
8. Publisher
9. Purpose
10. Status
11. Title

After a user selects a category, a text area will be populated for the user to enter their filter criteria. After the user enters their desired filter criteria, the apply button will become enabled. Clicking the apply button will filter the results displayed in the table accordingly.

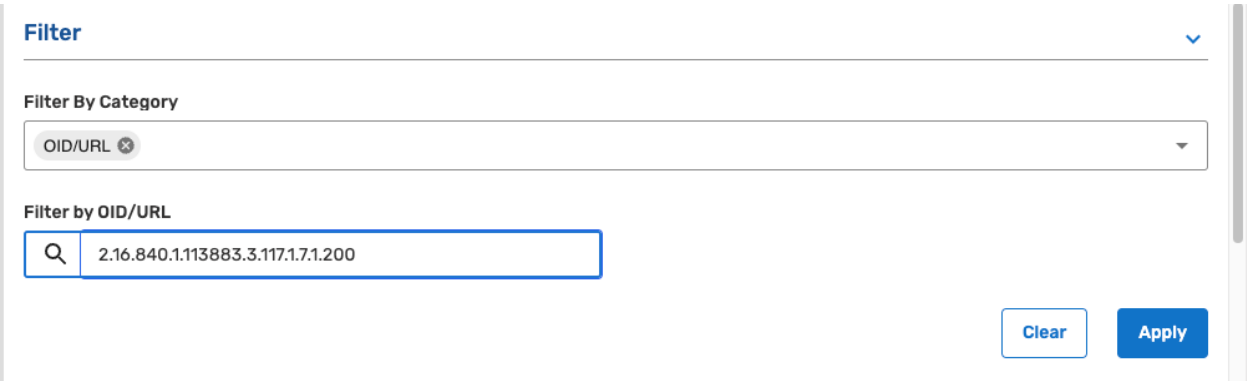


Image: Value Set Filter by OID

9.3.4.3 Results Section

Results from the users' search and filter will appear in a table in the results section. The value sets' Title, Steward, OID, and Status will be displayed. Each value set will also have a select button to perform actions on the value set. Clicking "Select" will provide users with three options

1. **Apply** – Selecting this option will result in MADiE attempting to add the value set to the measure CQL displayed on the left-hand side. If the addition was successful, you will see the value set in the CQL as well as a success message. If the value set could not be added, an error message will be displayed.
2. **Edit** – Selecting this option will display a pop-up, allowing users to enter a suffix for their value set. A suffix must be numeric and a maximum of four numbers. After entering the suffix and selecting "Apply," the modal will close and MADiE will attempt to add the value set and suffix to the CQL on the left-hand side. If the addition was successful, you will see the value set in the CQL as well as a success message. If the value set could not be added, an error message will be displayed.
3. **Details** – Selecting this option will display a pop-up with a JSON response containing information about the value set, i.e., profile, last updated, version, and purpose will be returned. Users can use this information to ensure they have selected the correct value set.

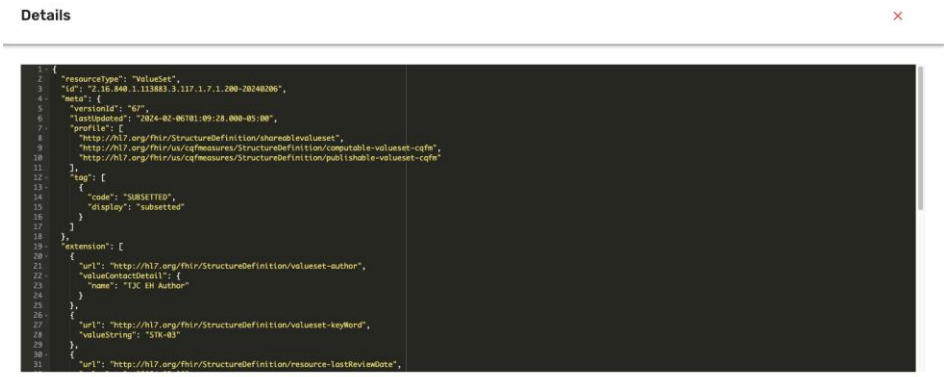


Image: Value Set Details

If no results are found the results table will display “No Results were found.”

Important: After a value set has been applied, with or without a suffix, users must click “Save” for the CQL to be saved with the new value set. Users can add many value sets and make other edits to the CQL prior to clicking save but ensure “Save” is clicked prior to navigating away from the page for the edits to be saved.

Image: Value Set Results Table

9.3.5 Codes Search and Apply

This tab is selected by default. This tab has two subtabs, Code and Saved Codes.

9.3.5.1 Code

The Code tab is where users can search VSAC for a specific code. This tab has two collapsible sections, Code(s), and Results. Code(s) is where the user will enter information to add to the search. Three user entries are present:

1. **Code Systems** – This dropdown is used to select the code system the user is searching in, SNOMED, ICD10CM, etc. Only one code system can be selected at a time.
2. **Code System Version** – This dropdown is populated after the user selects a code system. It will list all relevant versions for the code system
3. **Code** – This is a text field for the user to enter the code for which they are searching.

After filling out all three input fields and selecting “Search,” MADiE will query VSAC for the code.

Results are returned in a table in the results section. The Code, Description, Code System, and System Version are displayed. An action dropdown titled “Select” provides the user the following options:

1. **Apply** – Selecting this option will result in MADiE attempting to add the code to the measure CQL displayed on the left-hand side. If the addition was successful, you will see the code in the CQL as well as a success message. If the code cannot be added an error message will be displayed.
2. **Edit** – Selecting this option will display a pop-up containing the information about the code, allowing the user to enter a suffix for the code. Suffixes must be numeric and have a maximum of four numbers. The user can also select "Include Code System Version." After entering a suffix and selecting "Apply," the modal will close MADiE will attempt to add the code and suffix to the CQL on the left-hand side.

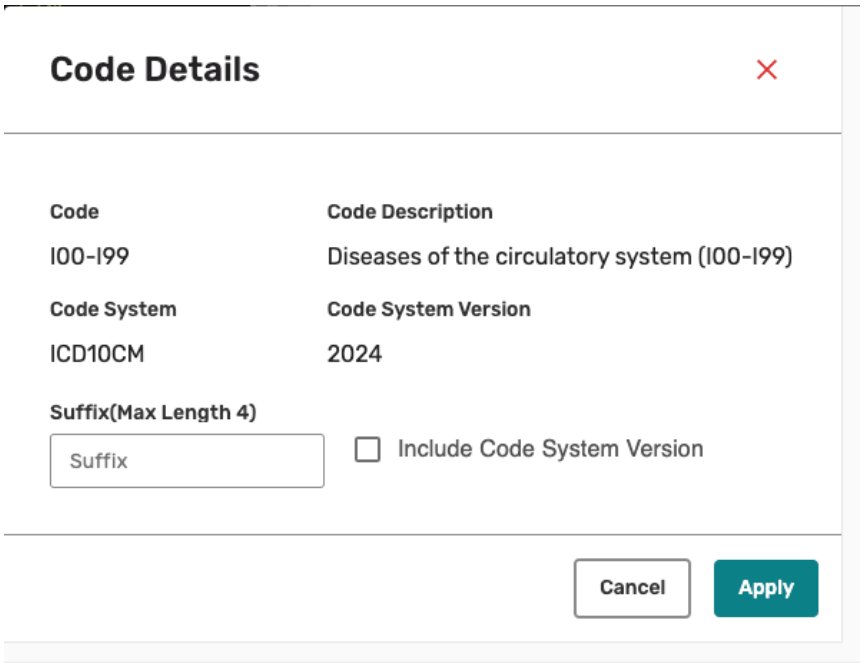


Image: Code Details Editor Modal

If no results are found, the results table will display "No Results were found."

Important: After a code has been applied, with or without a suffix, users must click "Save" for the CQL to be saved with the new code. Users can add many codes and make other edits to the CQL prior to clicking save, but "Save" must be clicked prior to navigating away from the page for the changes to be saved.

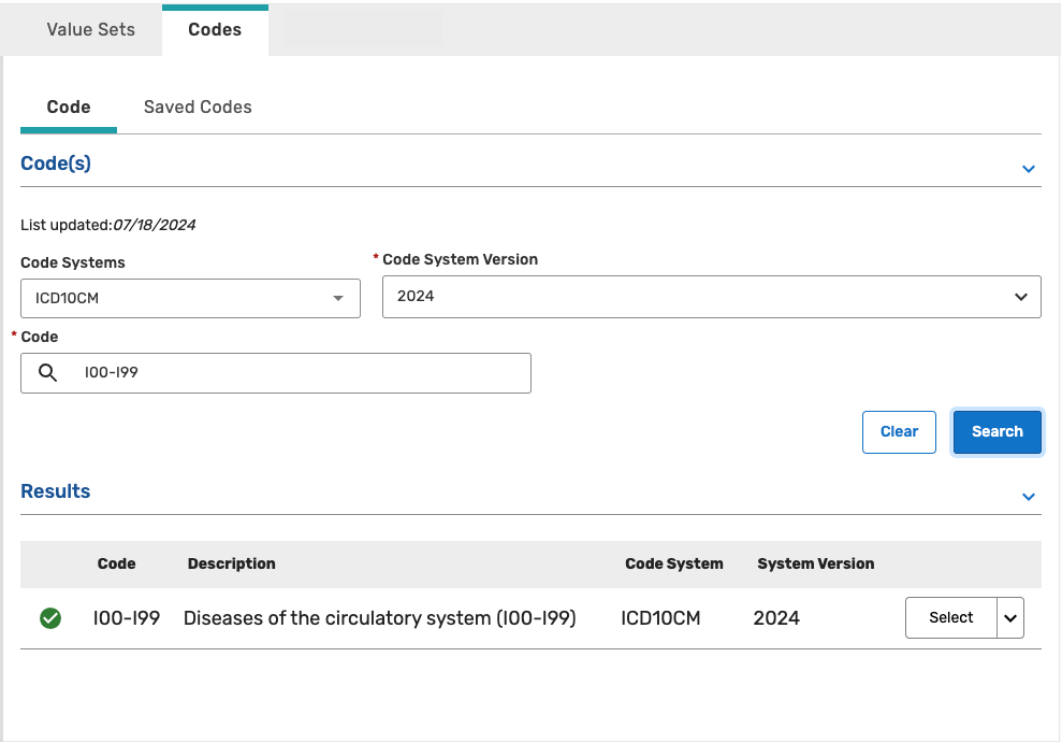


Image: Code Search and Results Table

9.3.5.2 Saved Codes

Codes that have been added to the measure CQL via search and apply or manually typing into the CQL will be displayed in a table here. The table will display the Code, Description, Code System, System Version and have an action dropdown titled "Select." Clicking the "Select" action dropdown will provide the users with the following options:

1. **Remove** – Selecting this option allows users to remove the code from the CQL. Clicking "Remove" will provide a pop-up ensuring that the user wants to delete the code. If the user wishes to move forward with deleting, they can click "Yes, Delete" and the code will be removed from the measure CQL. If the user decides the code should not be deleted, they should click "Cancel." The pop-up will close, and the code will remain. **Note:** This will automatically save the measure CQL, and a save action will not be required.
2. **Edit** – This option allows users to edit the suffix associated with the code. A pop-up will open with information about the code and then a text area to enter a suffix. Suffixes must be numeric and a maximum of 4 numbers. In this pop-up, the user can also select to Include Code System Version. After entering a suffix, the user can click "Apply," the pop-up will close and the code with a suffix will attempt to be added to the CQL on the left-hand side.

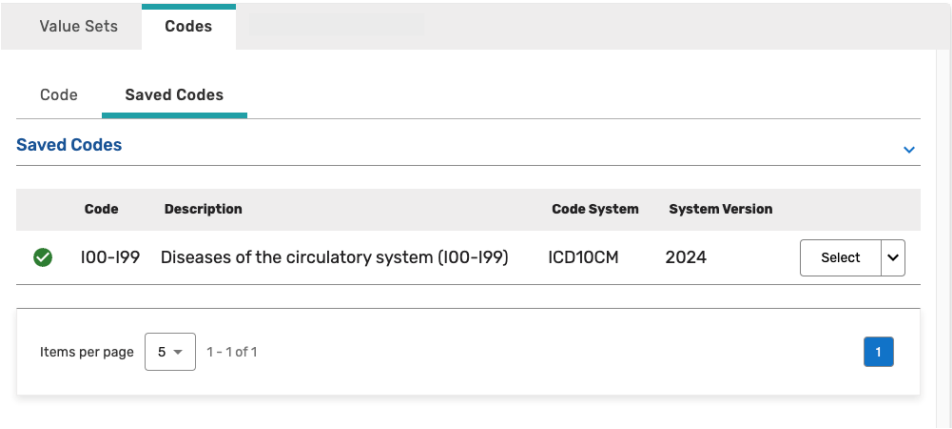


Image: Saved Codes Table

9.3.6 Parameters Builder

This tab allows users to construct Parameters to be inserted into the measure's CQL. Users must first enter the Parameter Name, followed by typing in the parameter's logic into the expression editor. After the logic is specified, users can click "Clear" if they no longer want to add the parameter. Users can click "Apply" to insert the parameter into the appropriate location in the measure CQL. **Note**: Users must save the measure CQL for this change to be permanent.

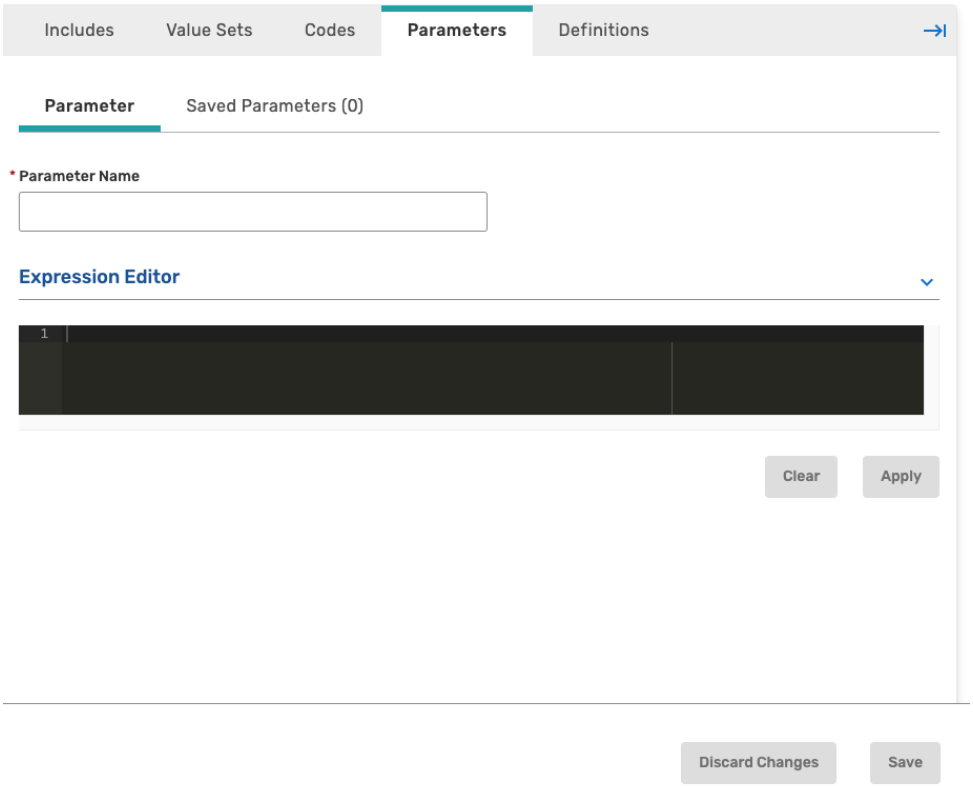


Image: Parameters Tabs

9.3.6.1 Saved Parameters

This subtab is where users can see the parameters already saved in their measure CQL. A table will be displayed with all the parameters listed. Users will have the ability to delete a parameter or edit a parameter from this table.

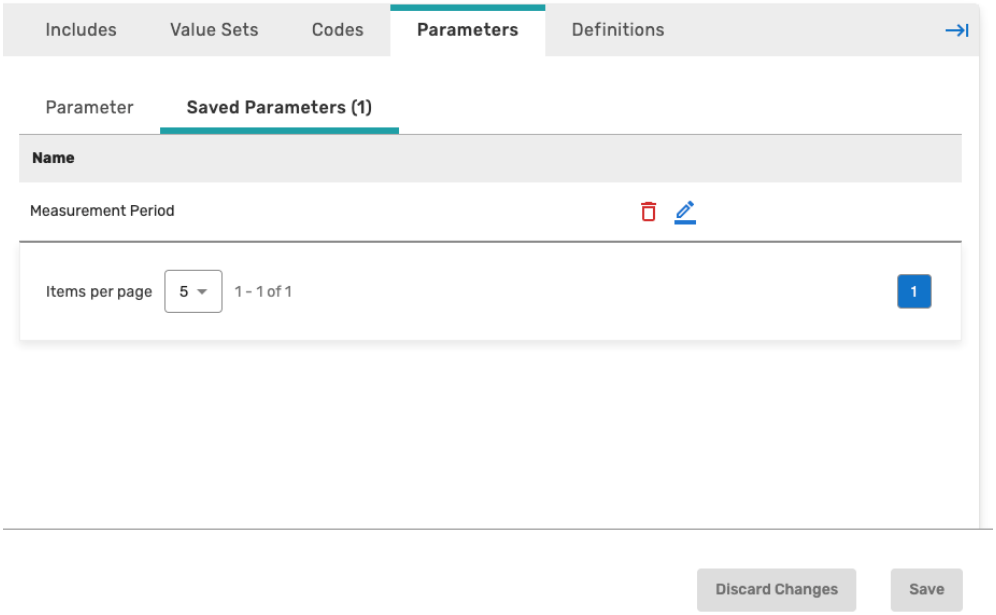


Image: Saved Parameters Subtab

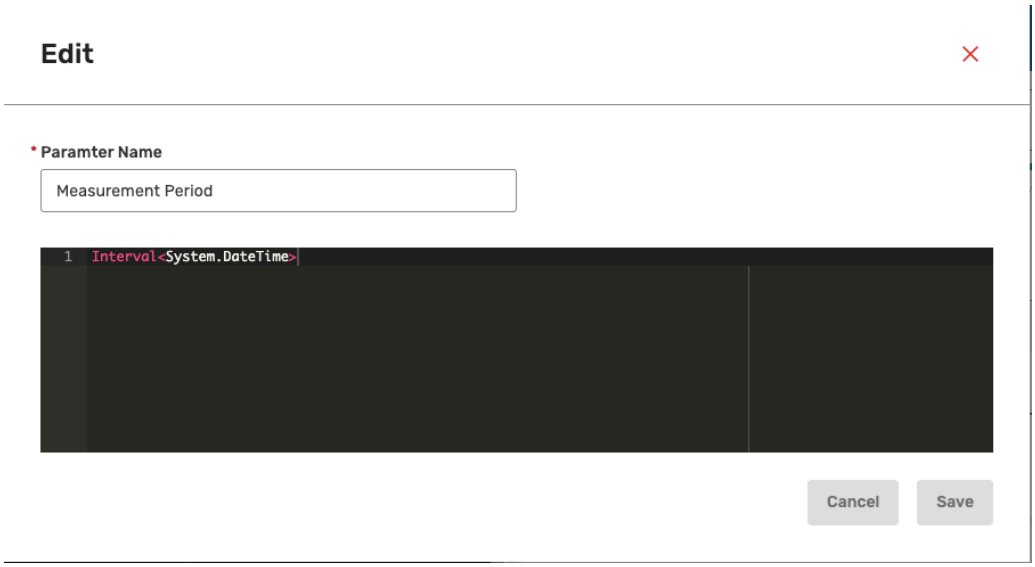


Image: Edit Parameter Modal

9.3.7 Definitions Builder

MADiE allows users to use the “Definitions” builder to help generate definitions as well as edit previously saved definitions.

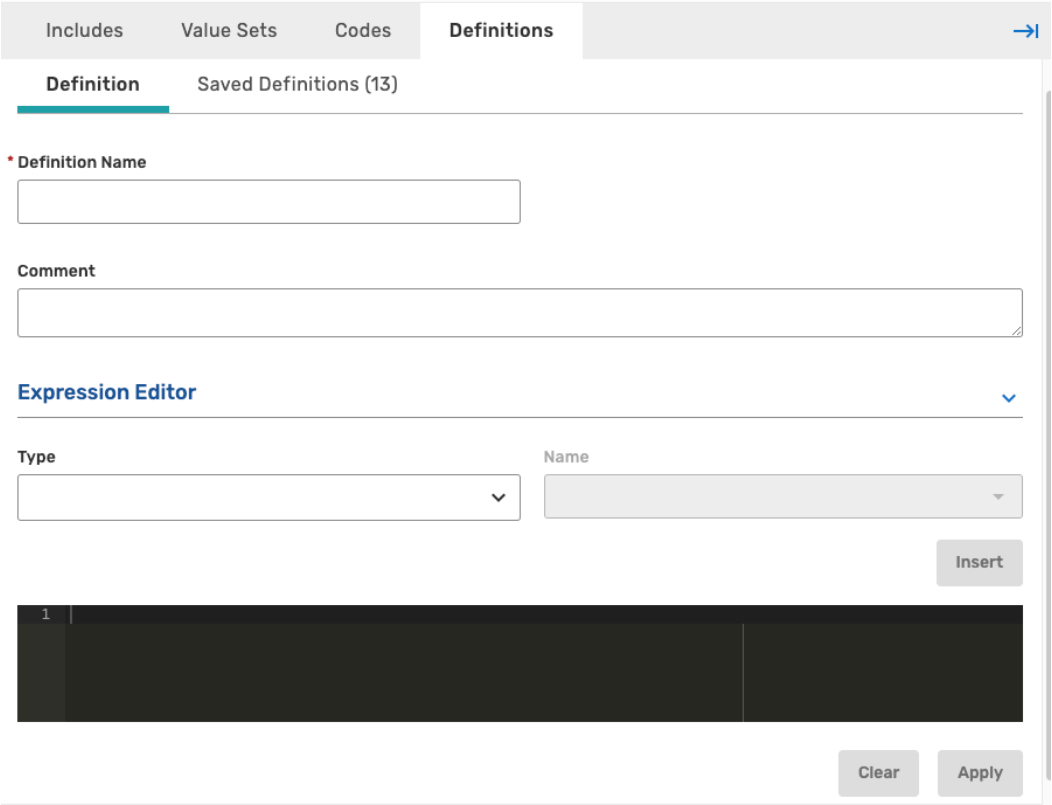


Image: Definition Builder

9.3.7.1 Definitions Tab

This tab is where users will build their definitions. Users should enter their definition name and then choose to add a comment to be added to the CQL explaining what the definition is doing. Then users should move to the expression editor below. The expression editor contains a Type dropdown, Name dropdown, and a CQL Editor. First select a value from the type dropdown. After selecting a type, the Name dropdown will populate with relevant options. Select the Name relevant for your definition. Then select "Insert." The CQL snippet will then be added to the editor where the curser is. If the user has not clicked in the editor yet, it will be added to the bottom of the editor. Users can continue to repeat this process and type directly into the editor until the definition is complete. Finally, to apply the definition to the CQL, select "Apply" located below the editor. This will place the definition into the measure CQL at the bottom of the definitions. Users can continue to add definitions in this manner. When adding definitions is complete, the user must select "Save" for the CQL to be saved.

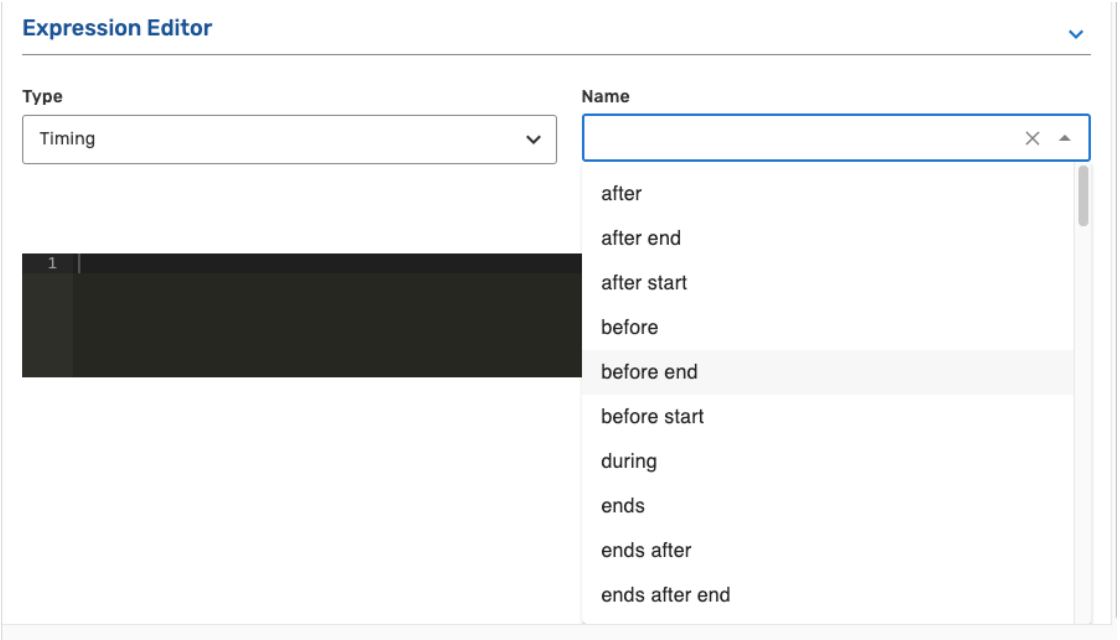


Image: Name Dropdown Options for Type Timing

9.3.7.2 Saved Definitions Tab

This tab will allow users to view and edit existing definitions in the measure CQL. It contains a paginated table that will show the definition name, definition return type, a delete button, and an edit button.

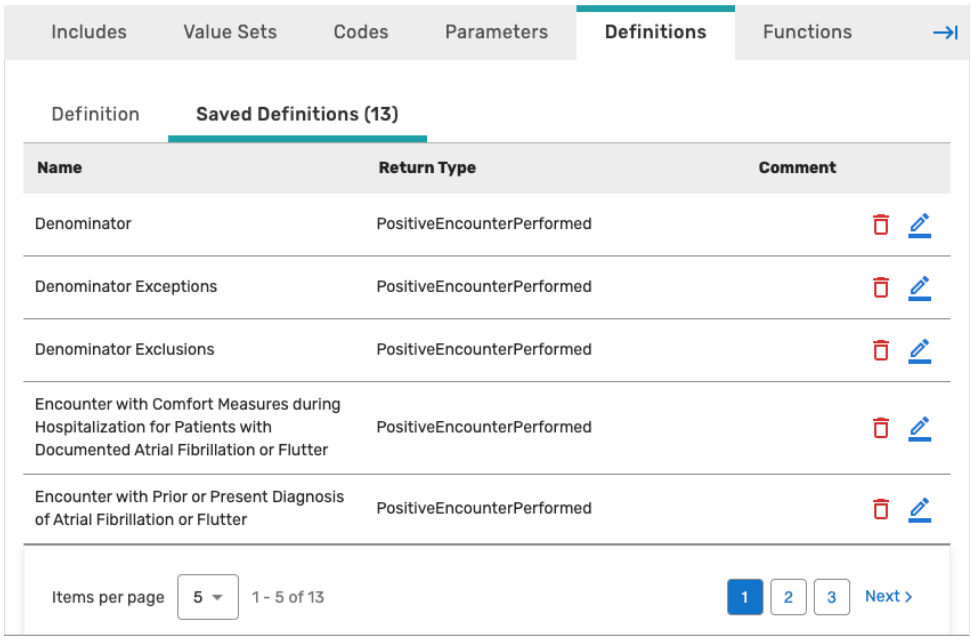


Image: Saved Definitions

To delete the definition, locate the correct definition, select the trashcan icon, and confirm the deletion by clicking “Yes, Delete.”

To edit a definition, locate the correct definition and select the pencil icon. This will open a definition modal and allow the user to edit the definition. Users can update the definition name, comment, and definition body. To edit the body users can either type in the small editor or select an item from the type dropdown, then name dropdown, and click “Insert.” This modal will also be where the user can find the definition return type.

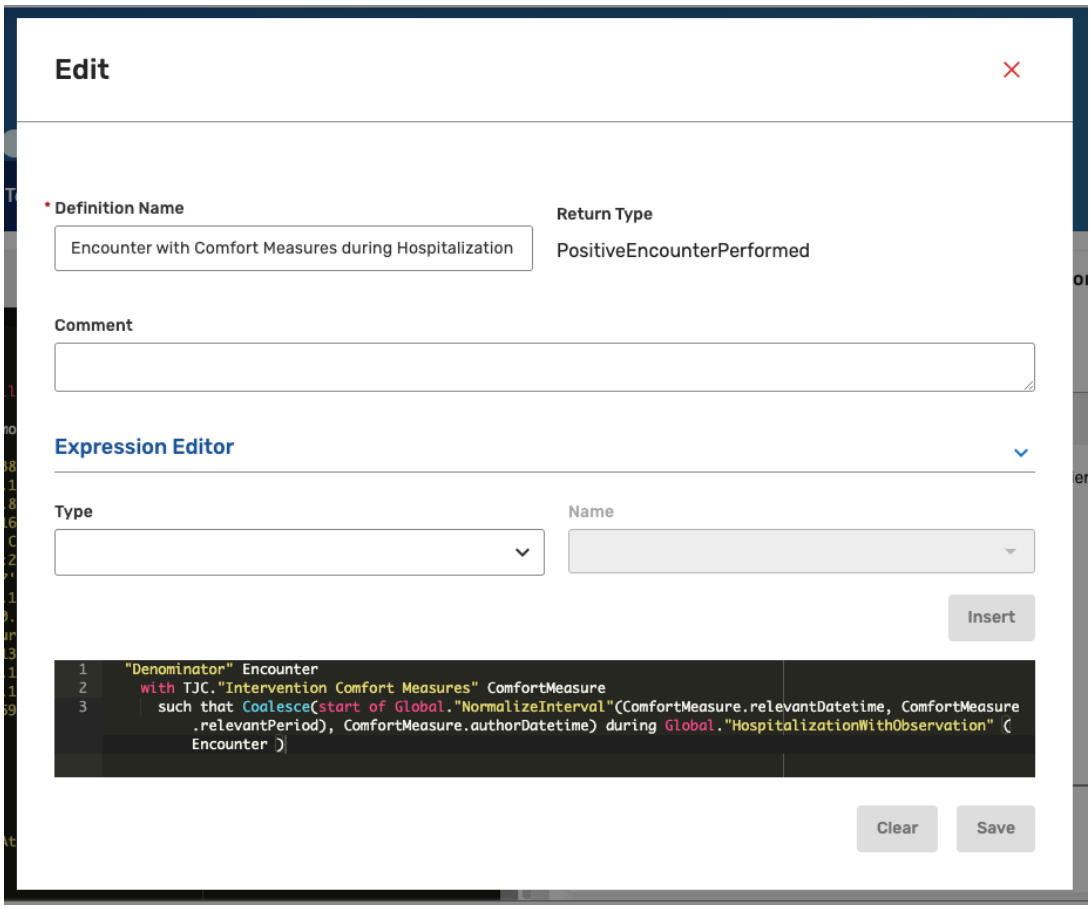


Image: Definition Edit Modal

Users that only have view access to a measure can open up the definition editor with view-only access. This allows users to gather more information about the definition but not edit it.

9.3.8 Functions Builder

MADiE allows users to use the Function tab to build both functions and fluent functions. Users can also edit existing functions on this tab.

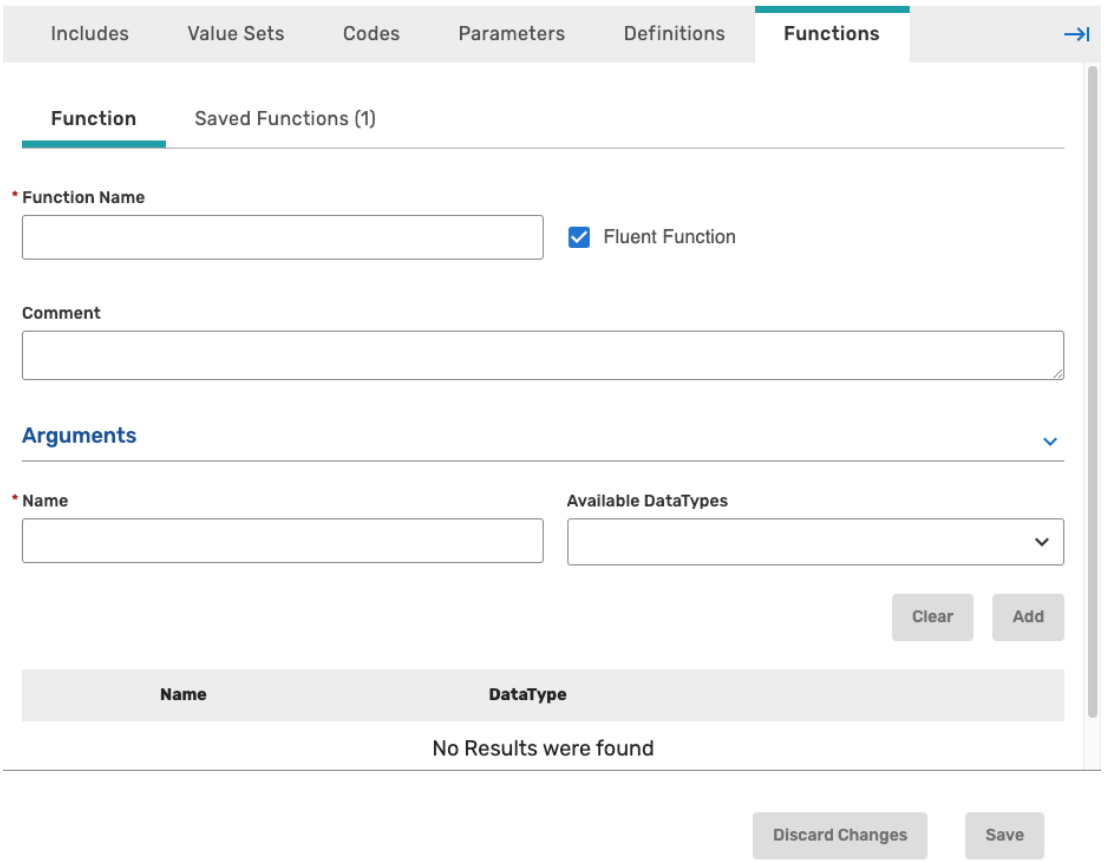


Image: Function builder

9.3.8.1 Functions tab

This tab allows users to construct a function or a fluent function. First, a user should enter the functions name. Next to the name is a check box to specify if this function will be a fluent function. To specify fluent function, leave the checkbox checked. If writing a normal function, uncheck the checkbox. Next, a comment can be added to provide more information about what the function will complete, the arguments to pass in, as well as the return. This field is optional. After adding a comment, users should next add any arguments. Start by adding an argument name followed by selecting the argument's datatype from the dropdown of available types. Should the type you need not be in the dropdown, you can select "Other." Users will then need to manually type the argument type in the other text field.

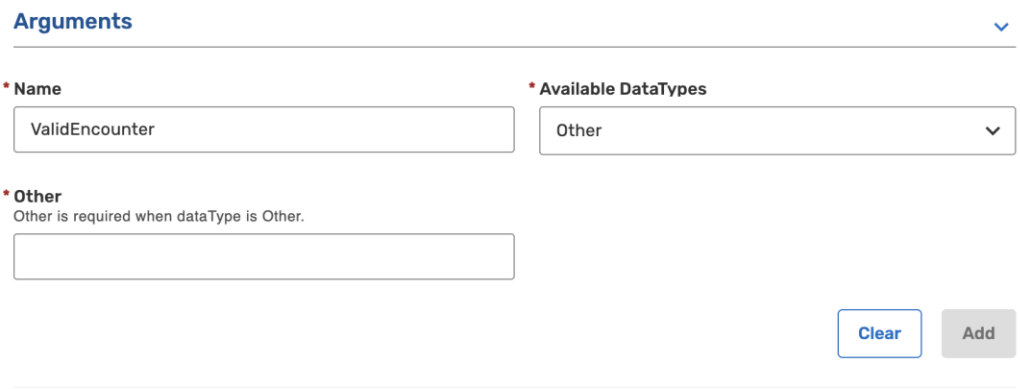


Image: Arguments – Other DataType

After completing the argument, click "Add." This will add the argument to the function. Users can continue to add arguments to the function until all arguments needed are listed in the argument table. Should an argument be added in error, it can be deleted by clicking the trashcan icon in the row in the arguments table. **Note**: fluent functions require an argument to be valid and for the function to be added to the CQL. For non-fluent functions, arguments are optional.

Image: Added Arguments Table

The final step in creating a function is the expression Editor. Very similarly to definitions, the function expression editor contains a Type dropdown, Name dropdown, and a CQL Editor. First select a value from the type dropdown. After selecting a type, the Name dropdown will populate with relevant options. Select the Name relevant for your function. Then select "Insert." The CQL snippet will then be added to the editor where the curser is. If the user has not clicked in the editor yet, it will be added to the bottom of the editor. Users can continue to repeat this process and type directly into the editor until the function is complete.

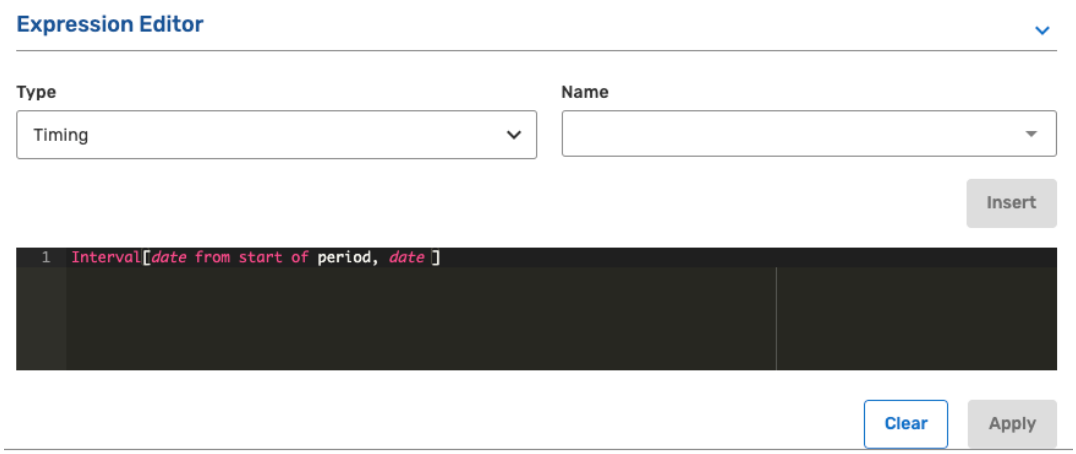


Image: Function Expression Editor

Finally, to apply the function to the CQL, select "Apply" located below the editor. This will place the completed function into the measure CQL at the bottom of the functions. Users can continue to add functions in this manner. When adding functions is complete, the user must select "Save" for the CQL to be saved.

9.3.8.2 Saved Functions Tab

This tab is where the user can view, edit, and delete functions that already exist in the CQL. It contains a paginated table that shows function name, if it is a fluent function, all argument names and types, any comment added and contains an icon for deleting and editing the function.

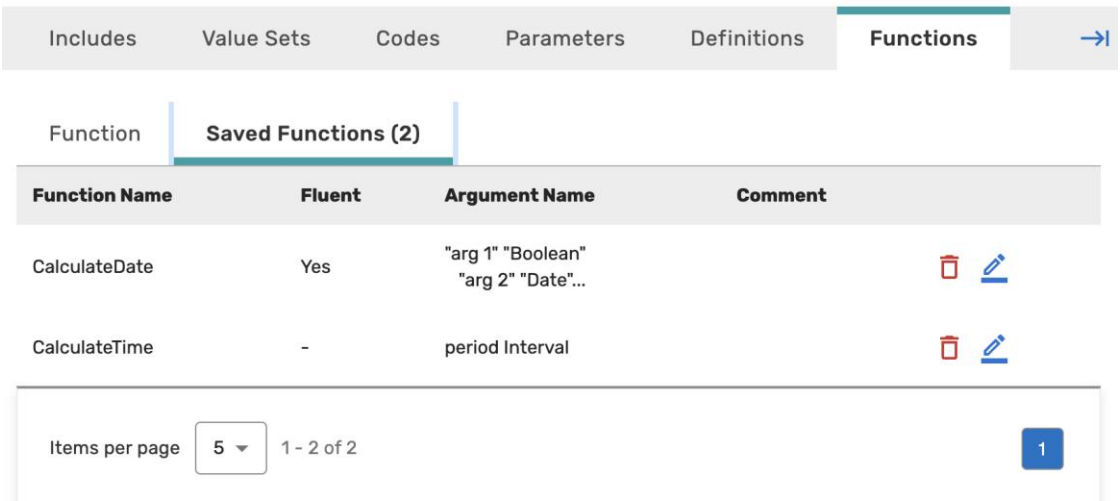


Image: Saved Function Table

To delete a function, locate the correct function, select the trashcan icon, and confirm the deletion by clicking "Yes, Delete."

To edit a function, locate the correct function and select the pencil icon. This will open a function modal and allow the user to edit the function. Users can update the function name, comment, any arguments, and function body. To edit the body users can either type in the small editor or select an item from the type dropdown, then name dropdown, and click "Insert."

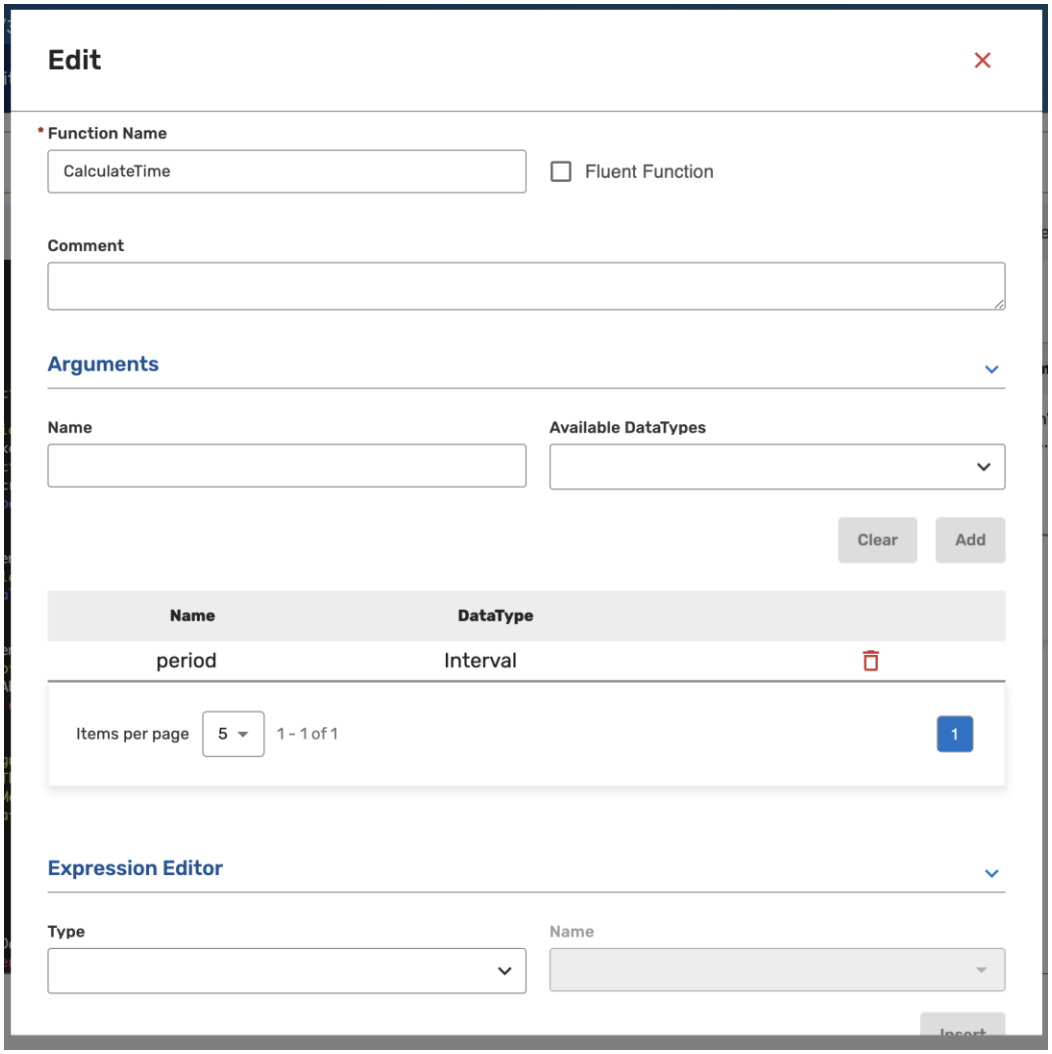


Image: Edit Function Modal

Users that only have view access to a measure can open up the function editor with view-only access. This allows users to gather more information about the function but not edit it.

9.3.9 CQL Errors and Warnings

The CQL Editor will display errors to users in two different ways. Errors can be displayed in the error span above the CQL editor, see section 5. They will also be displayed in the left side of the

CQL editor by the line numbers. The errors will display a red “x” next to the line number that is causing the error. Hovering over the red x will show a tool tip containing the error. Warnings will only be displayed as an orange triangle. Hovering over the triangle will display a tool tip containing the warning.

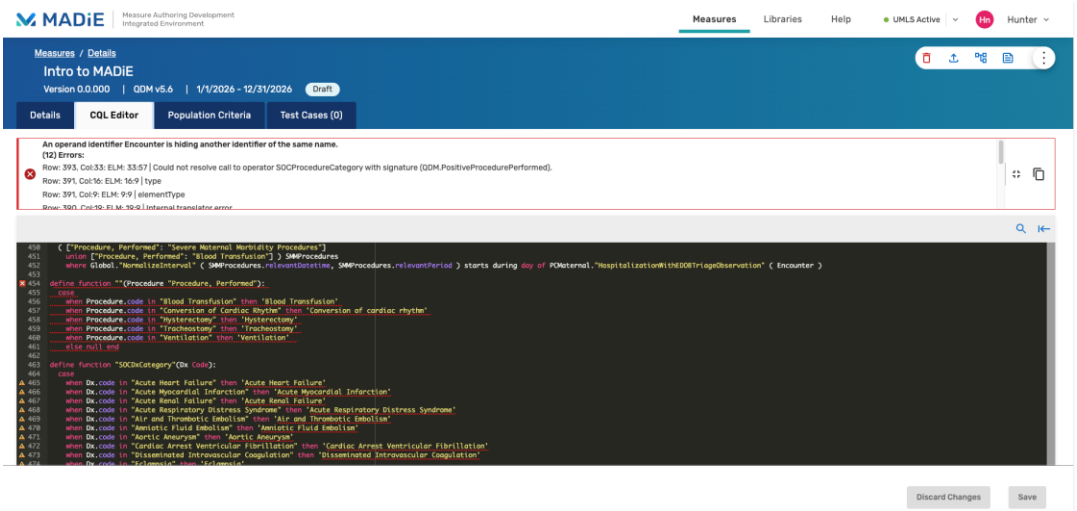


Image: CQL Errors and Warnings

9.4 Population Criteria Tab

Population Criteria varies depending on the of the Measure being edited.

9.4.1 QI-Core Population Criteria Tab

9.4.1.1 Criteria Subtab(s)

Population criteria for a measure can be added, configured, and managed in the Population Criteria tab (third tab from the left, next to CQL Editor, after opening a measure). In MADiE, measures may have multiple sets of population criteria (represented by Population Criteria 1, Population Criteria 2, etc.). To add additional population criteria, click the “Add Population Criteria” button below existing Criteria. Each population criteria tab will have a completion indicator. A red circle with an exclamation point indicates required fields for that population criteria are incomplete. A green circle with a checkmark indicates the criteria is complete. Optional fields that are incomplete will not display a completion indicator. Each population criteria can potentially have its own configuration for the following fields and subareas:

1. **Description:** The Description field describes a population criteria’s intent.
2. **Measure Type:** The Measure Type dropdown indicates whether the measure and population criteria configuration are used to examine a process, an outcome over time, a patient-reported outcome, or a structure measure such as utilization.

3. **Population Basis:** The Population Basis dropdown specifies the type of elements in the populations. **Note:** If a user changes the Population Basis for a specific Population, a warning will appear on save and if a user continues, Test Case expected values for that Population will be cleared.
4. **Scoring:** The Scoring dropdown indicates how calculation is performed for the measure. **Note:** If a user changes the Scoring for a specific Population, a warning will appear on save and if a user continues, the test case expected values for that Population will be cleared.
5. **Scoring Unit:** The Scoring Unit field defines the expected units of measure for the measure score.
6. **Scoring Precision:** The Scoring Precision field defines the number of decimal places, or the precision, the score should be reported to.
7. **Populations:** The Populations subarea within a set of population criteria display configurable populations corresponding to the Scoring selected. Populations that may be displayed include:
    a. Initial Population 1
    b. Initial Population 2 (Only relevant under specific scenarios. See section 9.4.1.2 for more information)
    c. Measure Population
    d. Measure Population Exclusion
    e. Denominator
    f. Denominator Exclusion
    g. Numerator
    h. Numerator Exclusion
    i. Denominator Exception
    j. Observation

    Note: If changes are made to any populations that have previously been included in the test cases they will be removed.
8. **Population Description:** For each population that is displayed a description field is also provided. The description field allows users to include narrative about what the populations are measuring. If these populations are left blank "None" will be added into the Human Readable and HQMF export.
9. **Stratifications:** The Stratifications subarea within a set of population criteria allows stratifications to be added, configured, and managed. Description fields are also included to communicate details about each stratification. If these descriptions are left blank "None" will be added into the Human Readable and HQMF export.

    Users can add 0 to many Stratifications. The fields to enter two stratifications are shown by default. To add another, select "Add Stratification." In the Stratification dropdown select the definition you wish to stratify. In the stratification association dropdown, select

the population the stratification is associated to. Only valid populations will appear in the dropdown. The optional description field can be used to add a description for each stratification.

For Stratification associations, this is a multi-select field. By default, all valid populations will be selected. If not all populations are associated to that stratification, the user must unselect the irrelevant measure populations.

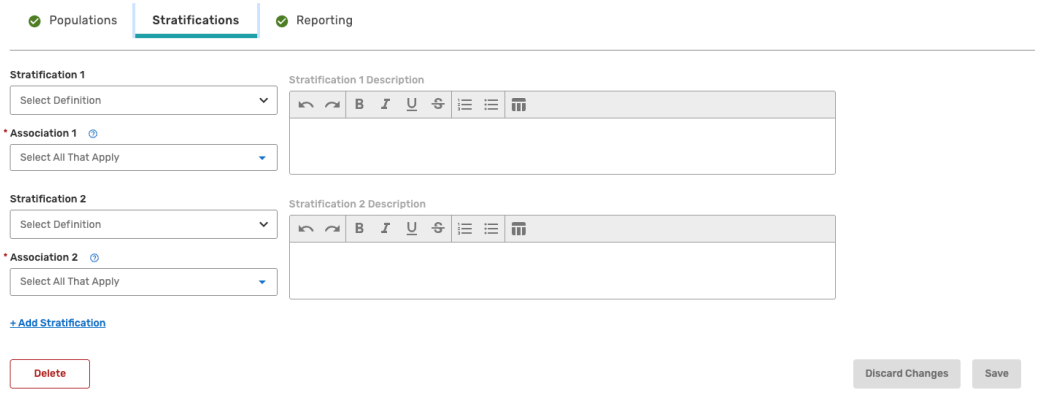


Image: QI-Core Stratifications

10. **Reporting:** The Reporting subarea includes the following:
    a. **Rate Aggregation:** The Rate Aggregation field describes how to combine calculated information based on logic in each of several populations into one summarized result. For measures that do not have rate aggregation, enter "None" into this field.
    b. **Improvement Notation:** The Improvement Notation dropdown provides direction for whether an increase or decrease in score is the preferred result. Improvement Notation is required for QI-Core measures. **Note:** Improvement Notation is optional for QI-Core Cohort measures.
    c. **Improvement Notation Description:** The improvement notation description allows the user to specify additional information around improvement Notation. Example: "Increase of 30% indicates improvement." During export of the measure, if improvement notation description is set, MADiE will automatically set the required extension with the information entered in this field.

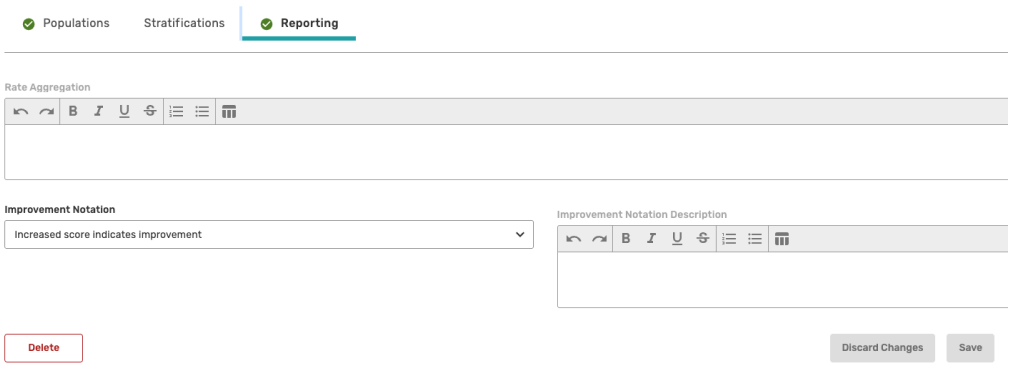


Image: Improvement Notation for QI-Core

9.4.1.2 Two Initial Populations

QI-Core Ratio measures allow users to specify two initial populations. To specify two initial populations, first select "Ratio" in the measures scoring dropdown. Second, click "+Add Initial Population." A second initial population will be added with the relevant associations to select.

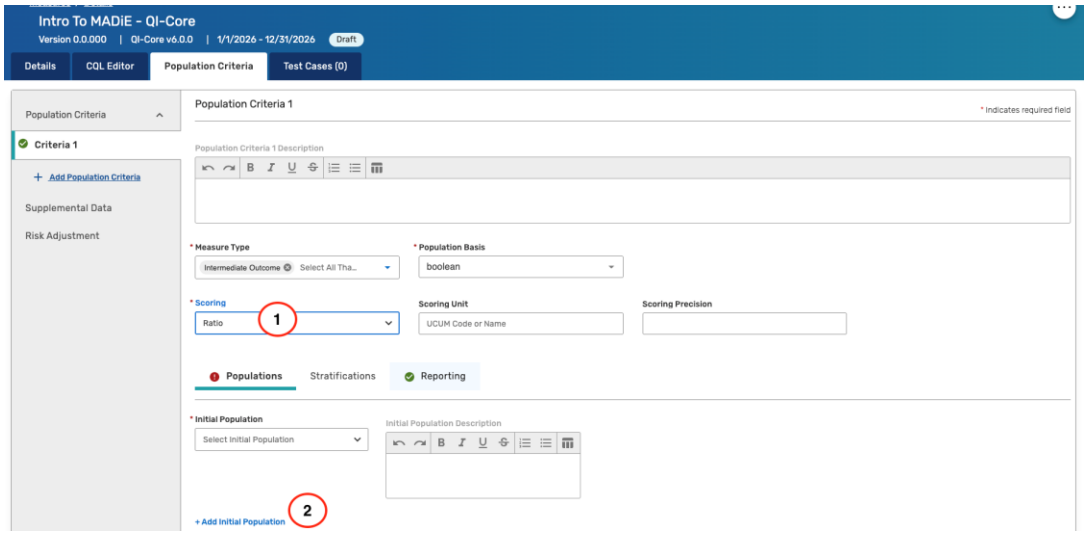


Image: Steps to Add Two Initial Populations

After two Initial populations are added users must specify which initial population is associated to the denominator and which is associated to the numerator. Users will do this by selecting the radio button next to Denominator or Numerator for that population's associations. The two association fields are connected, switching the association for Initial Population 1 will update the association for Initial Population 2. By default, Initial Population 1 will be associated with the Denominator and Initial Population 2 will be associated with the Numerator.

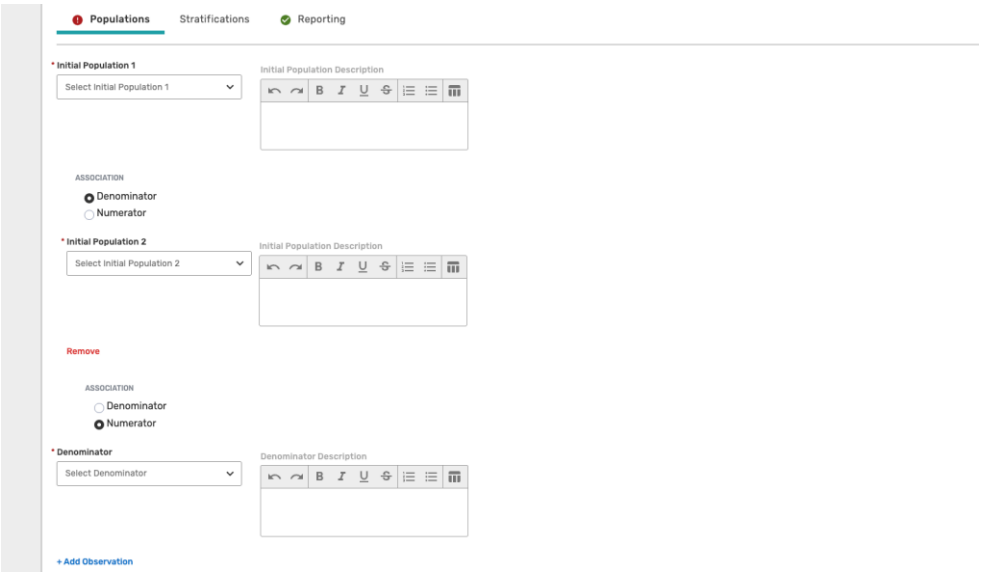


Image: Two Initial Populations Plus Associations

To remove the second initial population, users should click the red "Remove" link below the second Initial Population 2 dropdown. **Note**: Removing the second initial population will reset your test case's expected values.

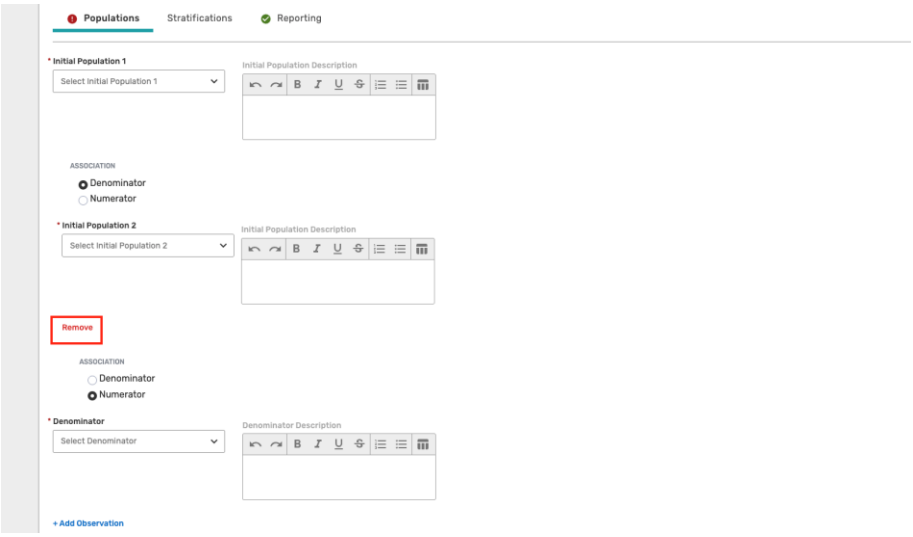


Image: Remove Initial Population Link

9.4.1.3 Supplemental Data Subtab

Supplemental data elements (SDE) are those that should be identified for each patient for whom the measure is applicable. This additional data can be used to evaluate disparities in care. The Supplemental Data subtab has a completion indicator. A green circle with checkmark indicates

all fields for Supplemental Data are complete. No indicator will display if data has not been entered.

CMS defines four supplemental data elements for each measure (payer, ethnicity, race, and ONC Administrative Sex). These are defined in the SupplementalDataElements standalone library. To include them in your measure, include the SupplementalDataElements library and in your measure CQL create definitions that reference the definitions in the library.

Any definitions created in the CQL workspace are available to be included in the measure as supplemental data elements if desired and can be viewed in the Definition multi select dropdown. Select all definitions that should become supplemental data elements. **Note:** MADiE limits users to select no more than 128 SDEs.

One SDE description exists per measure. Fill in the description value and save to set SDEs.

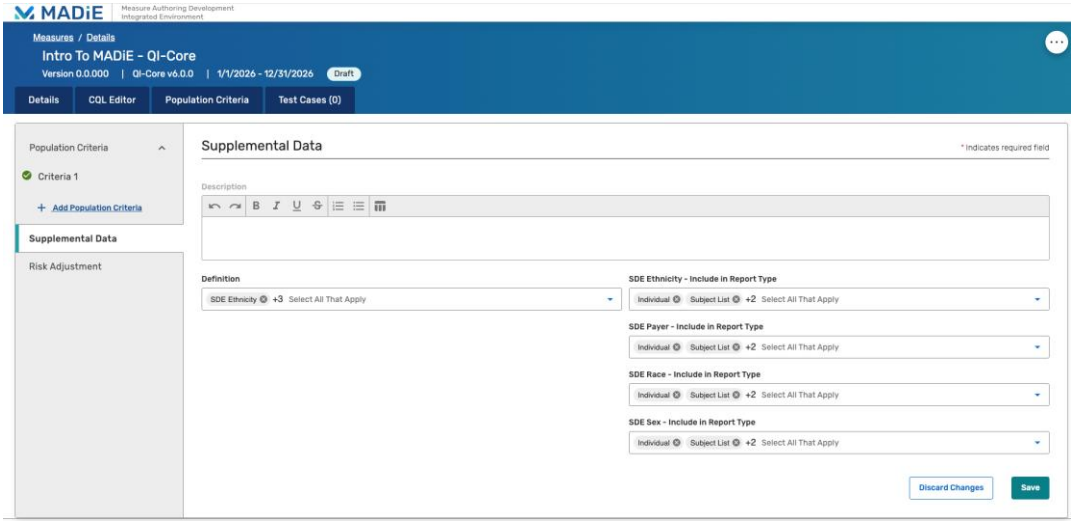


Image: Supplemental Data Subtab

9.4.1.3.1 Include in Report Type (QI-Core Only)

For QI-Core MADiE allows users to specify what report type the SDE should be included in. The options are:

- Individual
- Subject List
- Summary
- Data Collection

After selecting an SDE to include in the measure, a multi select dropdown will appear with all four report types selected by default. If the SDE should not be included in one or more of the

reports, uncheck the report it should not be included in. A multi-select dropdown for each selected SDE will be present. For more information on the Include in Report Type Extension please visit HL7s listing.

9.4.1.4 Risk Adjustment Subtab

Risk adjustment is the method of adjusting for clinical severity and conditions present at the start of care that can influence patient outcomes, making it difficult to make valid comparisons of outcome measures across providers. The Risk Adjustment subtab has a completion indicator. A green circle with checkmark indicates all fields are complete. No indicator will display if data has not been entered.

Any definitions created in the CQL workspace are available to be included in the measure to be Risk Adjustment Variables (RAV) if desired and can be viewed in the Definition multi select dropdown. Select all definitions that should become Risk Adjustment Variables. **Note**: MADiE limits users to select no more than 128 RAVs.

One RAV description exists per measure. Fill in the description value and save to set RAVs.

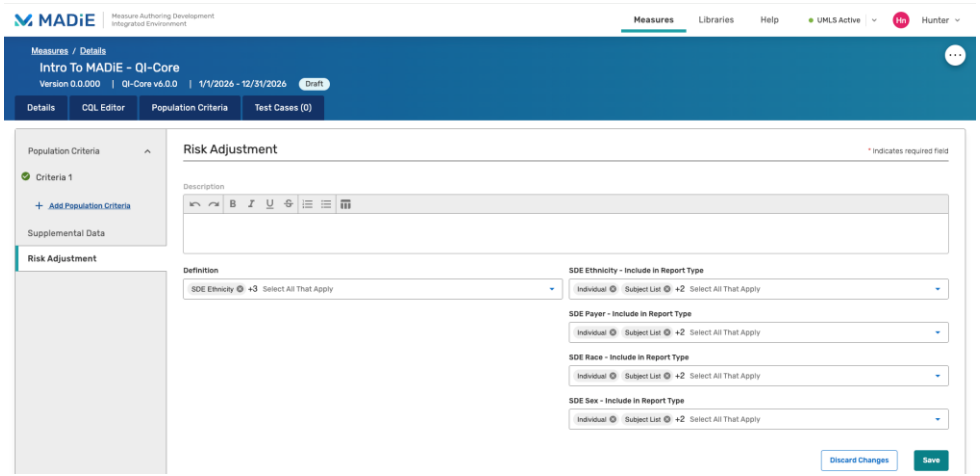


Image: Risk Adjustment Subtab

9.4.1.4.1 Include in Report Type (QI-Core Only)

For QI-Core MADiE allows users to specify what report type the RAV should be included in. The options are:

- Individual
- Subject List
- Summary
- Data Collection

After selecting a RAV to include in the measure, a multi select dropdown will appear with all four report types selected by default. If the RAV should not be included in one or more of the reports, uncheck the report it should not be included in. A multiselect dropdown for each selected RAV will be present. For more information on the Include in Report Type Extension, please visit HL7s listing.

9.4.2 QDM Population Criteria Tab

9.4.2.1 Base Configuration Subtab

In MADiE these elements are selected on the Base Configuration Subtab. Base Configuration has the following fields:

1. **Measure Type:** The Type dropdown indicates whether the measure and population criteria configuration are used to examine a process, an outcome over time, a patient-reported outcome, or a structure measure such as utilization.
2. **Scoring:** The Scoring dropdown indicates how calculation is performed for the measure. **Note:** If Scoring is changed, on save a warning will appear. If a user chooses to continue, the test case expected values will be cleared and the population fields on the Criteria Subtab will be reset.
3. **Patient Basis:** The Patient Basis specifies the type of elements in the populations. **Note:** If the Patient Basis is changed, on save a warning will appear. If a user chooses to continue, the test case expected values will be cleared.

The Base Configuration subtab has a completion indicator. A red circle with an exclamation point indicates one or more fields are incomplete. A green circle with checkmark indicates all fields are complete.

9.4.2.2 Criteria Subtab(s)

In MADiE, measures may have multiple sets of population criteria (represented by Population Criteria 1, Population Criteria 2, etc.). To add additional population criteria, click the “Add Population Criteria” button below existing Criteria. Each population criteria tab will have a completion indicator. A red circle with an exclamation point indicates one or more fields for that criteria are incomplete. A green circle with a checkmark indicates all fields for that criteria are complete. Each population criteria can potentially have its own configuration for the following fields and subareas:

1. **Description:** The Description field describes a population criteria’s intent.
2. **Scoring Unit:** The Scoring Unit field defines the expected units of measure for the measure score.

3. **Populations:** The Populations subarea within a set of population criteria display configurable populations corresponding to the Scoring selected. For each population that is displayed a description field is also provided. The description allows narrative about what the populations are measuring to be added. Populations that may be displayed include:
    a. Initial Population
    b. Measure Population
    c. Measure Population Exclusion
    d. Denominator
    e. Denominator Exclusion
    f. Numerator
    g. Numerator Exclusion
    h. Denominator Exception
    i. Observation

    Note: If changes are made to any populations that have previously been included in the test cases, the populations will be removed.

4. **Stratifications:** The Stratifications subarea within a set of population criteria allows stratifications to be added, configured, and managed. For each stratification that is displayed a description field is also provided. The description allows narrative to communicate details about each stratification.

    Users may add one or more Stratifications, if applicable to the measure. The fields to enter two stratifications are shown by default. To add another, select "Add Stratification." In the Stratification dropdown, select the definition you wish to stratify. Optional descriptions can be added for each stratification.

9.4.2.3 Reporting Subtab

The QDM Reporting subtab includes the following:

a. **Rate Aggregation:** The Rate Aggregation field describes how to combine calculated information based on logic in each of several populations into one summarized result. For measures that do not have rate aggregation, enter "None" into this field.
b. **Improvement Notation:** The Improvement Notation dropdown provides direction for whether an increase or decrease in score is the preferred result. QDM measures have one additional option, which is "Other." Users are also provided a text area to enter a description of the improvement notation for this measure. The text area is required when the user selects "Other" and is optional for the remaining available options

The Reporting subtab has a completion indicator. A red circle with an exclamation point indicates some fields are incomplete or an error is preventing the user from saving. A green circle with checkmark indicates the Reporting section is complete. No indicator will display if data has not been entered in any fields.

9.4.2.4 Supplemental Data Subtab

Supplemental data elements (SDE) are those that should be identified for each patient for whom the measure is applicable. This additional data can be used to evaluate disparities in care. The Supplemental Data subtab has a completion indicator. A red circle with an exclamation point indicates Supplemental Data fields are incomplete. A green circle with checkmark indicates the Supplemental Data fields are complete.

Any definitions created in the CQL workspace are available to be included in the measure as supplemental data elements if desired. These definitions can be viewed in the Definition multi select dropdown. Select all definitions that should become supplemental data elements.

Along with the multi select dropdown is a single text area for users to enter narrative around the measure's SDEs. Select all definitions, enter any relevant narrative, and select "Save" to set SDEs.

9.4.2.5 Risk Adjustment Subtab

Risk adjustment is the method of adjusting for clinical severity and conditions present at the start of care that can influence patient outcomes, making it difficult to make valid comparisons of outcome measures across providers. The Risk Adjustment subtab has a completion indicator. A red circle with an exclamation point indicates fields in the Risk Adjustment section are incomplete. A green circle with a checkmark indicates the fields in the Risk Adjustment section are complete.

Any definitions created in the CQL workspace are available to be included in the measure as Risk Adjustment Variables (RAV) if desired and can be viewed in the Definition multi select dropdown. Select all definitions that should become Risk Adjustment Variables.

In addition to the multi select dropdown, there is a text area to enter narrative for the RAVs. Select all definitions, enter any relevant narrative, and select "Save" to set RAVs.

9.5 Test Cases Tab

Test cases for a measure can be added, edited, and managed in the Test Cases tab (fourth tab from the left, next to Population Criteria, when a measure is open). The Test Cases tab displays a table of all test cases that have been created along with Pass/Fail and coverage results. Above the table in the Test Cases tab, the following are displayed (see image below):

1. **Left Navigation Collapse Icon**: Clicking this icon collapses the left navigation bar, giving users more screen space to view the test case table. To expand the navigation bar again, click the Left Navigation Expand Icon (see screenshots below). **Note**: If the left

navigation bar is collapsed and the user navigates away from the test case list page, MADiE will preserve the collapsed state when returning to the page. To access the navigation tabs, users will need to manually expand the bar.

2. **Test Cases Passing Indicator:** The Test Cases Passing Indicator displays the percentage of test cases that are passing (i.e., have matching expected and actual values) as it relates to measure logic relevant to a measure's first set of population criteria. The indicator also shows the percentage as a fraction, displaying the number of passing test cases to the total number of test cases. Click the Run Test(s) button to calculate results. Clicking on this tab will show the Test Case Table List, see below for more details.

Test Cases Coverage Indicator: The Coverage Indicator displays the percentage of the measure logic that has been evaluated by the test cases as it relates to a measure's first set of population criteria. Click the Run All Tests button to calculate results. When execution results are available, hovering over the coverage percentage displays a tooltip showing the number of covered clauses e.g., '{fraction} logical clauses in your CQL are covered'. Clicking on the Coverage tab will show you code coverage highlighting.

3. **Test Case Validation Indicator:** This percentage is the percentage of test cases that are QI-Core STU6 valid. Only test cases that are valid are counted in the percentage, so test cases that are pending count as invalid until the result is returned. This indicator also shows the percentage as a fraction, displaying the number of valid test cases over the total number of test cases. This percentage and fraction are only displayed for QI-Core STU6 measures.
4. **Reports:** This button opens a dropdown providing all reports available on the measure. Currently, Overlapping Codes is the only option in the dropdown. See section 9.9 for more details.
5. **Import:** Allows users to import test cases into MADiE for QI-Core measures. See section 9.8 for more details.
6. **+ New Case:** The + New Case button initiates the creation of a new Test Case.
7. **Run Test(s)**: The Execute Test Cases button initiates calculation of all test cases against measure logic related to the population criteria selected. The Test Cases Passing Indicator, Coverage Indicator, and individual test case, Pass/Fail results are updated. The Run Test(s) Button must be clicked each time to calculate new results.
8. **Filter By Dropdown**: Works with the search field. Allows users to select what field the user wants to use to search. See section 9.5.1.
9. **Search Field**: Free text area where the user can insert their search term to search. See section 9.5.1.
10. **Test Case Action Center:** This is present on all test case pages. Users can select an option by clicking the icons in the action center. The available actions are:
    a. **Delete:** Allows a user to delete any, up to all, test cases selected for the given measure. This action cannot be undone. See section 9.5.6.2 for more details.
    b. **Shift Test Case Dates:** Allows users to shift the dates on the individual test case a specific number of years. See section 9.5.12.2 for more information

c. **Clone:** Allows users to clone that test case in the same measure. This feature will duplicate the selected test case, adding the test case unique id to the title to ensure unique test case name. The title can be edited on the Test Case Details tab. Only one test case can be cloned at a time. Invalid test cases cannot be cloned, and the dropdown will not contain the Clone Test Case option.

d. **Make JSON Match UI:** Allows users to update the selected test case data entered in the test case title and given fields and sets the JSON patient first and last name with the data. See section 9.5.13 for more details.

e. **Copy Test Cases to Another Measure:** Allows users to copy one, multiple, or all test cases to another measure of the same model and model version. See section 9.5.7 for more details.

f. **Export Test Cases**: Allows users to export selected test cases. For QDM, users must first execute test cases and then all test cases will be exported either as QRDA or Excel. See section 9.7 for more details. For QI-Core, first select the test case(s) to export, then select "Transaction Bundle" or "Collection Bundle." See section 9.6 for more details.

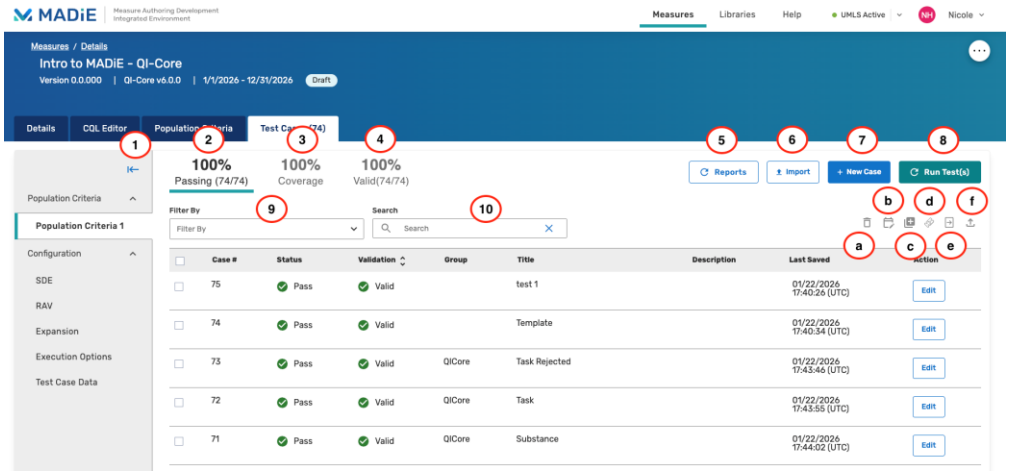


Image: Test Case List Page Actions – QI-Core Measure

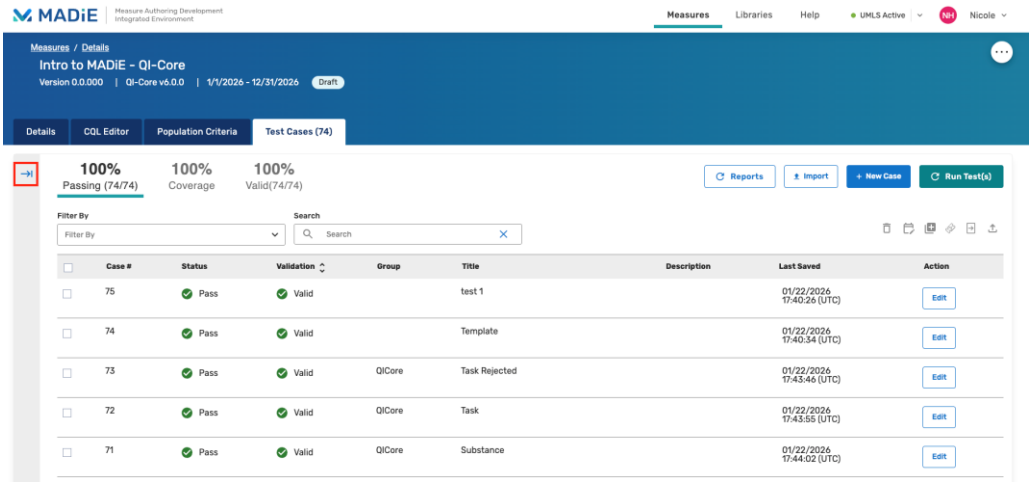


Image: Left Navigation Expand Icon

The Test Cases table lists all the measure's test cases and displays additional information about each test case including (see image below):

1. **Checkbox**: Each test case has a checkbox that allows users to select one to all test cases and perform delete, clone, and export action on all test cases selected. If the checkbox in the header is checked, all visible test cases will be selected.
2. **Case #:** Each test case on a measure is given a Case #. These will begin with 1 on the oldest test case and continue until each test case has a unique number. The default sort order will be descending order on Case #.
3. **Status:** When the Run All Tests button has been clicked, the Pass/Fail column displays Pass or Fail for a test case, indicating if the test case's expected values match actual values calculated. Pass/Fail results are no longer automatically calculated after opening the test cases tab. The Run All Tests button must be clicked each time to calculate new results. For QI-Core measures, "Invalid" may also display if the test cases contained errors that need to be corrected before it can be executed successfully.
4. **Validation:** This column shows the validation status for QI-Core STU6 test cases: Valid (green checkmark), Invalid (purple exclamation point), or Pending (refresh icon). It only appears for QI-Core STU6 measures and does not update automatically; users must refresh the page or navigate away and back to see changes.
5. **Test Case Group:** The Test Case Group column displays the name of the test case group to which a test case may be assigned.
6. **Title:** The Title column displays the title of a test case.
7. **Description:** The Description column displays the description given to a test case.
8. **Last Saved -**The date and time the test case was last saved populates here. **Note**: The time will display in UTC timezone and not the users' local timezone.
9. **Edit** - Users who own or have share access to the measure will have an Edit button in the last column of the test case list page. This allows users to open the test case for editing.

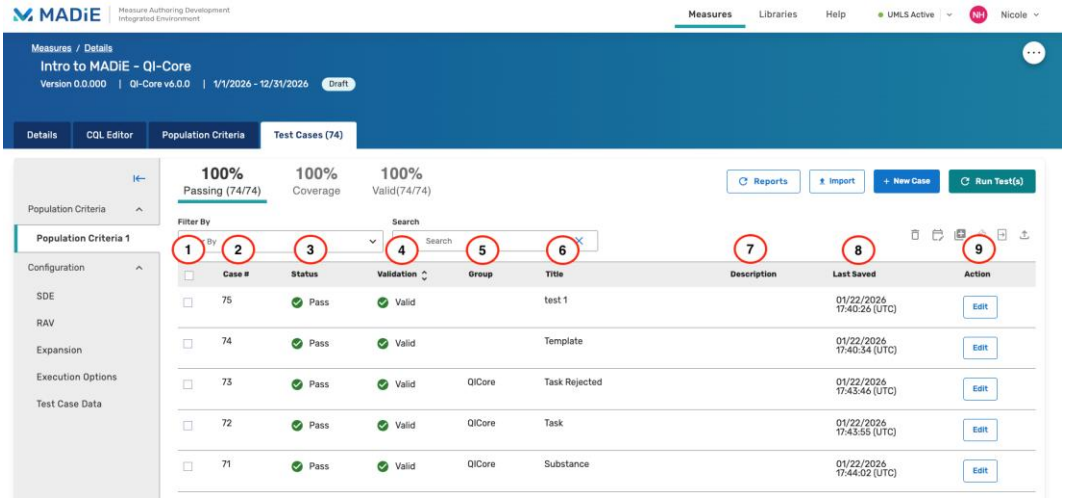
10. **View (Not Pictured)** – Measures that are not editable by the logged in user will have a view button in the last column on the test case list page. This will allow the user to open the test case to view the contents.
11. 

Image: Test Case List Page Table Headers – QI-Core Measure

Test Cases will appear with the Case # in descending order. Users can update the way the test case table is sorted based on Case #, Status, Group, Title, Description, and Last Saved. Clicking on the column to sort once will sort that column in ascending order. Clicking a second time will sort in descending order. Clicking a third time will return the table to the default sort.

9.5.1 Test Case Searching

Users can search test cases in MADiE by using the “Filter By” dropdown and the “Search” field. The Filter By dropdown is a single select dropdown that allows users to specify which test case fields they want to search in. The options are Status, Group, Title, and Description. If no filter is selected all 4 fields will be searched.

After deciding on a filter option, the user should enter their search term in the Search text box. Once the search term is entered, users can hit enter on the keyboard or click the magnifying glass icon on the search. The Test Case table will then be updated with the results. The table will paginate and filter with the reduced results. To clear the search and see all test cases click the “x” in the search text area.

9.5.2 Creating a New Test Case

To create a new test case, initiate the process by clicking on the + New Test Case button in the upper right, below the blue header area. The Create New Test Case modal will appear, prompting you to enter the following information:

1. **Title:** The Title field is the name of your test case. **Note**: Description can only contain 250 characters.
2. **Description:** The Description field communicates what the test case is testing. **Note**: Description can only contain 250 characters.
3. **Group:** Group field assigns a test case to a group that can be used to sort and organize the test case table according to your preferences. **Note**: Description can only contain 250 characters.

Once the information above has been entered you have the option to:

1. **Cancel:** The Cancel button discontinues the creation of a new test case and closes the modal.
2. **Save:** The Save button saves the test case using the information entered into the Create New Test Case modal.

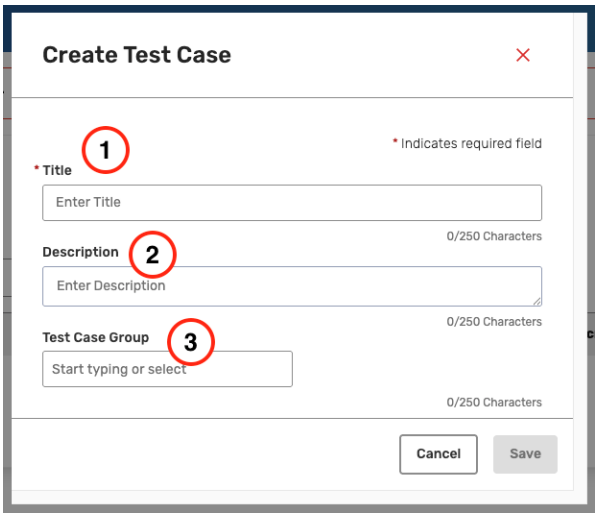


Image: Create Test Case Modal

After the test case is created, a Case # is automatically assigned.

9.5.3 Test Case Builder

Once a test case has been created, it can be opened for building by clicking on the test case's select button in the test case table. Once opened, the test case shows two panels on each side of the screen. The left panel contains the test case builder. The right panel contains Logic Calculation Highlighting information. See section 9.5.4 for more information.

9.5.3.1 Test Case Breadcrumbs

In the upper left-hand corner of the edit test case page, directly below the measure tabs, users can click “Test Cases” to navigate back to the test case list page or click on the test case Breadcrumbs. The breadcrumb will list the “Test Case Number: Group – Title” for the current test case. The breadcrumb is a dropdown that will provide a list of all test cases in the measure. Users will be able to switch between the test cases here. Before switching to a different test case, ensure your test case is saved. If it is not, your changes will be lost.

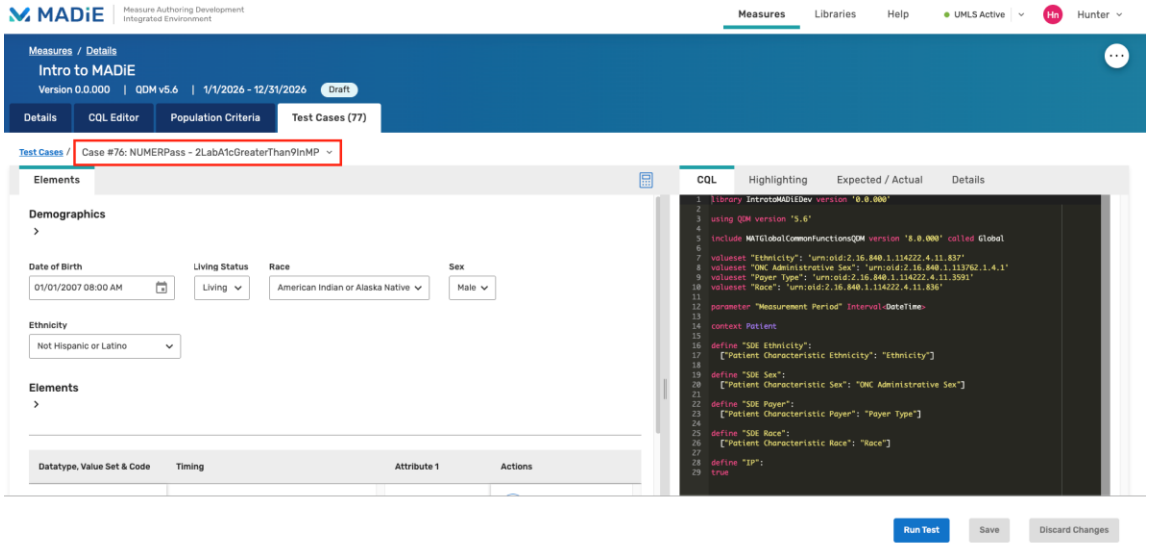


Image: Test Case Breadcrumb

9.5.3.2 JSON Editor (QI-Core Measures)

The JSON editor is only available for QI-Core measures. QDM measures do not have a standard JSON representation and JSON cannot be utilized for QDM measures in MADiE.

The JSON Editor is where the JSON logic of a test case can be viewed and edited. All information can be added, edited, deleted, and must be in correct JSON syntax. When saving, any errors in the JSON will be displayed. JSON files may contain errors and warnings. JSON containing errors can be saved but may prevent dependent functionality from working properly (e.g., test case calculation). JSON files containing just warnings can be saved and calculated. Verify the JSON is complete, and errors are resolved to ensure proper functionality of areas dependent on it.

MADiE will validate the PatientID used for the patient throughout the test case JSON. When the test case JSON is saved MADiE will automatically add a PatientID for the patient if it was not included and will overwrite the PatientID if the PatientID used was inconsistent. This will be in UUID format. At this time, only the PatientID will be overwritten or added. No reference to the patient will be updated with the new PatientID.

When editing dates with timezones in MADiE, MADiE will force the timezone offset to be zero when users click “Save.” This will ensure consistency across all timezones and allow users to get consistent results regardless of the timezone the user is in when running test cases.

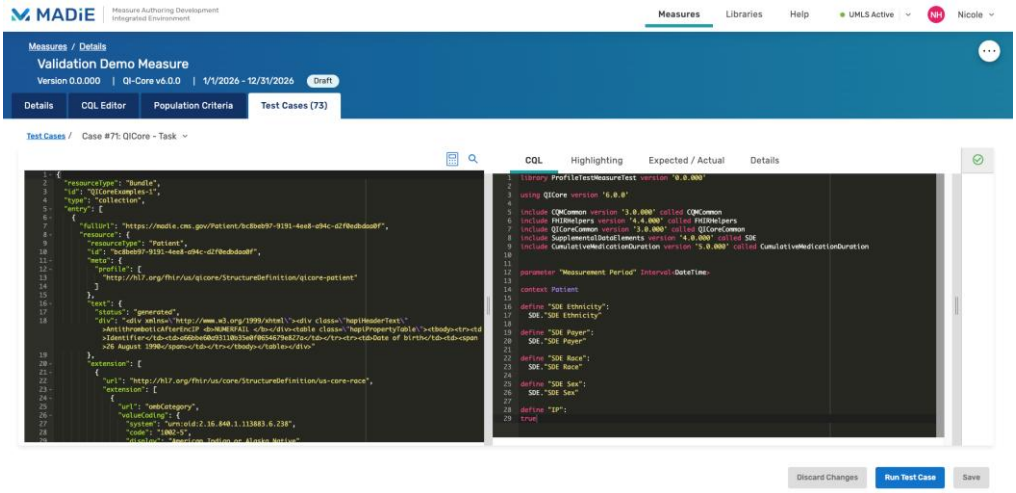


Image: QI-Core Test Case Editing

9.5.3.3 Find and Replace

The JSON Editor allows users to find specific phrases in the JSON. User can perform a search by clicking the search icon above the Editor or, with your curser in the Editor, press Ctrl+F or Cmd+F on the keyboard to open the Find & Replace window. Users can type a string in the Find text area and the editor will find all locations of the test. Use the arrow keys to navigate forward and backward between the elements. Clicking “All” will highlight all instances of the text.

If users with edit access wish to replace text, use the find function to find the text to replace. Then type in the replacement text in the “Replace with” text area. Clicking “Replace” will replace the current highlighted text and highlight the next instance of the word. Selecting “All” will replace every instance of the find text in the JSON. If the replace field is not shown in the pop-up, simply click the Plus button below the find text area and it will appear.

9.5.3.4 Test Case Validation (QI-Core v4.1.1)

QI-Core v 4.1.1 test case validations will display in the Validation Errors tab. Warning messages are also displayed in this section. The section is expandable or collapsible by clicking on the text “Validations.” To increase the size of your working area, select the divider and drag it to the left to make the section bigger or smaller.

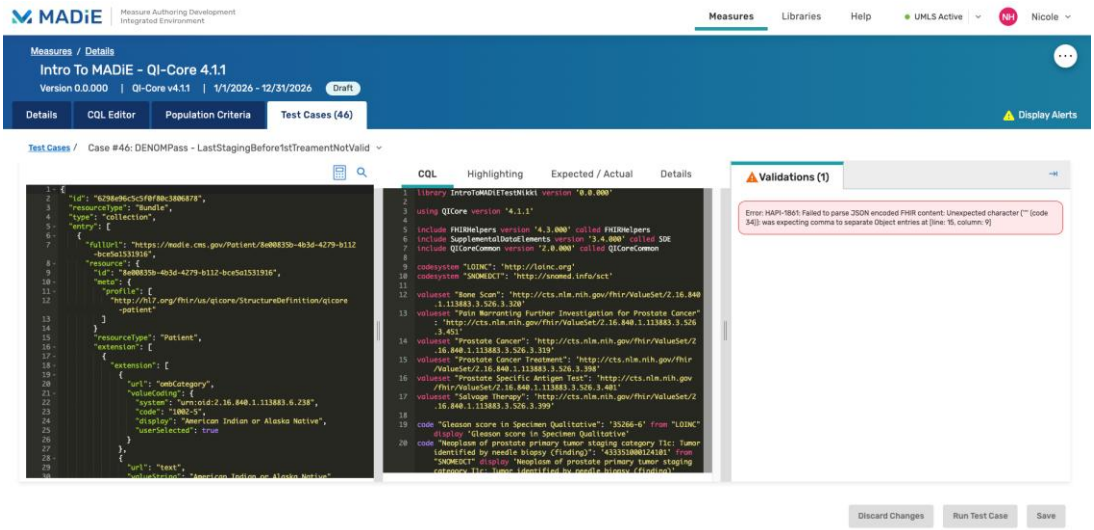


Image: QI-Core v4.1.1 Validations

9.5.3.5 Test Case Validation (QI-Core v6.0.0)

In MADiE, validation for QI-Core STU6 test cases runs automatically and asynchronously after a test case is saved. Once saved, the test case enters a validation queue, and its status is set to Pending. After a short delay, the status will update to either Valid or Invalid, depending on the outcome. Because validation happens in the background, users can continue working, whether in the same test case, a different one, or even after logging out. The results will be available when the user returns.

A test case is considered valid if the JSON is properly formatted, all required data elements are present, codes align with the appropriate value set bindings, and no validation errors are returned. Any error will mark the test case as invalid. Warnings or informational messages do not affect validity.

Validation status is visible on the test case list page, but to view detailed messages, users must open the test case for editing. The validation panel on the right-hand side displays the current status icon. Clicking the icon expands the panel to show messages from the validation service with errors appearing first, followed by warnings, then informational notes.

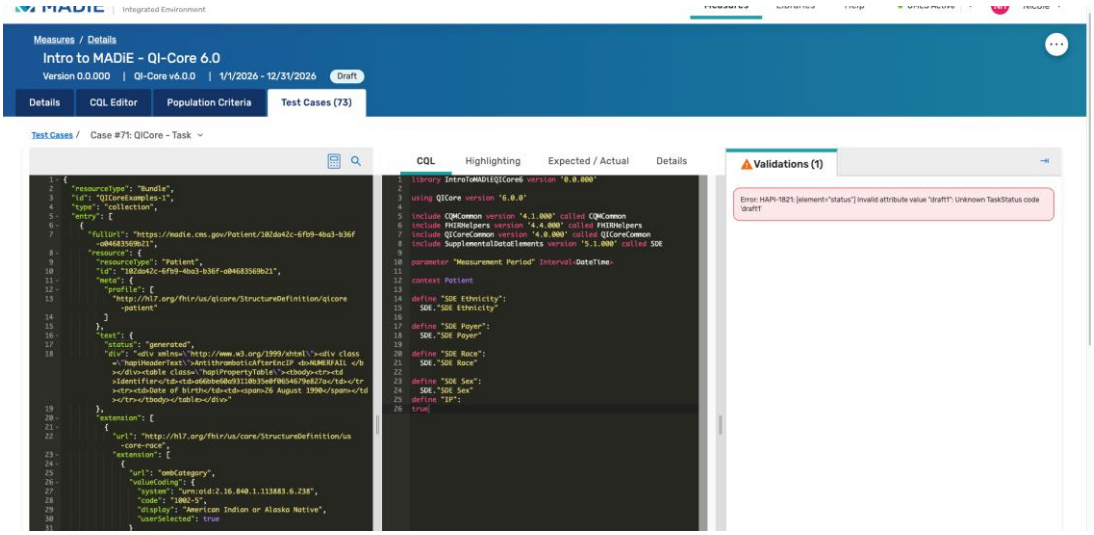


Image: QI-Core STU6 Invalid Test Case Example

MADiE uses value set expansions via VSAC or an in-memory validation expansion bundle that was created specifically for MADiE. However, some value sets may not expand successfully due to size, external hosting, or structure. In these cases, MADiE cannot confirm whether a code is part of the intended value set, and a warning will be shown, even if the code is technically correct. These warnings will not be able to be resolved by the user, but they are informational and do not block a test case being valid or measure release.

Note: Validation does not test the logic or expected outcomes of the measure. That is handled through the Run Test Case feature and the pass/fail percentage. Please refer to section 9.5.11 for information on how to execute test cases regardless of validation status.

9.5.3.6 User Interface (QDM Measures)

Currently, only QDM measures have a User Interface (UI) editor for test cases.

Since QDM does not have a standardized JSON format MADiE allows the user to build test cases via a UI. This UI allows the user to enter information about the Test Case via dropdowns, date time fields and from form text fields.

9.5.3.6.1 Demographics

Demographics contains information about the Test Cases Demographics

- **Date of Birth** – Required fields where users enter the test case's date and birth in "MM/DD/YYYY hh:mm aa" form. Users can either type the date and time manually or utilize the date time picker.
- **Living Status** – Dropdown allowing users to specify the living status of the test case
- **Race** – Dropdown allowing users to specify the Race of the test case. The contents of the dropdown are populated based off the Race value set the user specifies in the measure

CQL and set in the SDE section on population criteria. If no Race value set is specified in the CQL and added to the SDEs in population criteria, the race dropdown will be empty.

- **Sex** – Dropdown allowing users to specify the Sex of the test case. The contents of the dropdown are populated based off the Sex value set the user specifies in the measure CQL and set in the SDE section on population criteria. If no Sex value set is specified in the CQL and added to the SDEs in population criteria, the Sex dropdown will be empty.
- **Ethnicity** – Dropdown allowing users to specify the Ethnicity of the test case. The contents of the dropdown are populated based off the Ethnicity value set the user specifies in the measure CQL and set in the SDE section on population criteria. If no Ethnicity value set is specified in the CQL and added to the SDEs in population criteria, the Ethnicity dropdown will be empty

9.5.3.6.2 Elements

The Elements section is where users will add the QDM Elements relevant to the measure. It is comprised of three different sections:

- Category tabs
- Elements Builder
- Elements Table

First, is a list of category tabs, i.e., Encounter, Medication, etc. Each measure will contain a different list of categories as only the categories utilized in the measure CQL will display. Each category lists the different elements that can be added to the Test Case. To see elements under different categories, click on the desired category. To add an element to the test case, click on that element's "+" button. This will open the element builder.

The element builder is where users will provide additional data about the element. It has a few sections:

- **Timing Section** – where users will enter any time information about the element, e.g., "Relevant Period – Start," "Relevant Period – End," etc.
- **Codes Tab** – where users will enter information about the primary code for the element. by selecting "Custom Code" or a code system that is utilized in the CQL of the measure.
    - **Custom** – two free text boxes will appear for the user to enter a custom code system and custom code.
    - **Existing Code System** – a dropdown containing all the available codes in that code system will appear for the user to select from.

  After the user fills in or selects all fields the user will then select "Add" to add the code to the elements.
- **Attributes Tab** – where users will select from an attribute dropdown containing attributes that are relevant to the element. Selecting an attribute will populate the type dropdown. Users should select the type needed. Many times, only one type is available.

Based on the type of attribute different UI elements will appear for the user to populate. Once all required fields are populated, select “Add” and the attribute will be added to the element. Users can add as many or as few attributes to the element that are needed. **Note**: If your attribute requires a Unit field, this must be entered with a valid UCUM unit. See here for a list of valid UCUM units. MADiE will attempt to provide a meaningful error message to help users pinpoint the correct unit if an invalid unit was entered.

At the bottom of this section is the Elements table. This table contains a row for each element added and a column for its Datatype, Value Set & Code, Timing, Attribute(s), and Actions. The number of columns for attributes is dynamic based on the number of attributes added to different elements. The table will become scrollable as the number of attribute columns grows. To edit the element, add or remove attributes, or adjust timing click on “Actions” and select “Edit.” To delete the element from the test case, click on “Actions” and select “Delete.” To clone an element, click on “Clone.” The cloned element will retain the same timing and attributes as the original element.

Test case edits will not be saved to the database until the user clicks the “Save” button. Prior to saving users can execute the test case by clicking "Run Test.” If the user determines the test case requires updating, changes can be made prior to saving. After saving the test case, if the user makes updates, clicks "Run Test" and determines the updates are not desirable the user can click 'Discard Changes.”

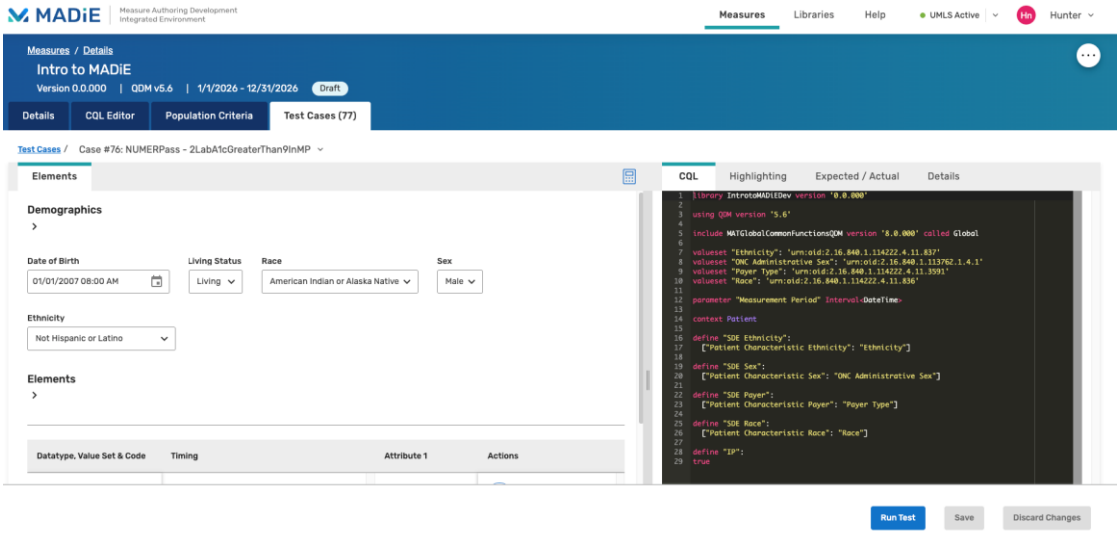


Image: QDM Test Case Elements Editor

9.5.4 Date Calculation Tool

The Date Calculation Tool on the Edit Test Case List page helps users efficiently manage date fields within test cases by offering two key functions, Duration/Difference and Computed Date.

The date calculation tool can be used by clicking the calculator icon in the header of the left side of the edit test case screen. This will open a Calculation Tool modal allowing users to calculate dates.

9.5.4.1 Duration/Difference

The Duration and Difference tab lets you calculate the time span between two dates with flexible precision. Start by selecting a Start Date, an End Date, and a Precision level (years, months, weeks, or days). You can click on "Today" under either date field to quickly set it to the current date.

After entering your values, click on "Calculate" to view two results:

- **Duration** – Counts only complete precision units between the two dates.
- **Difference** – Includes both complete and partial precision units between the dates.

If you want the end date included in the calculation, check "Include end date in calculation" before running it.

This tool is ideal for validating date ranges, coverage periods, or any logic that depends on elapsed time.

See the screen shot below for an example of the duration vs difference calculation. For a Start Date of "09/15/2025" and an End Date of "10/07/2025" with Precision set to "Weeks":

- Duration = 3 weeks
  This counts only the three full weeks completed between the two dates.
- Difference = 4 weeks
  This includes three full weeks plus one partial week, giving a total difference of four weeks.

Use Duration when you need whole precision units only, and Difference when partial units matter for your calculation.

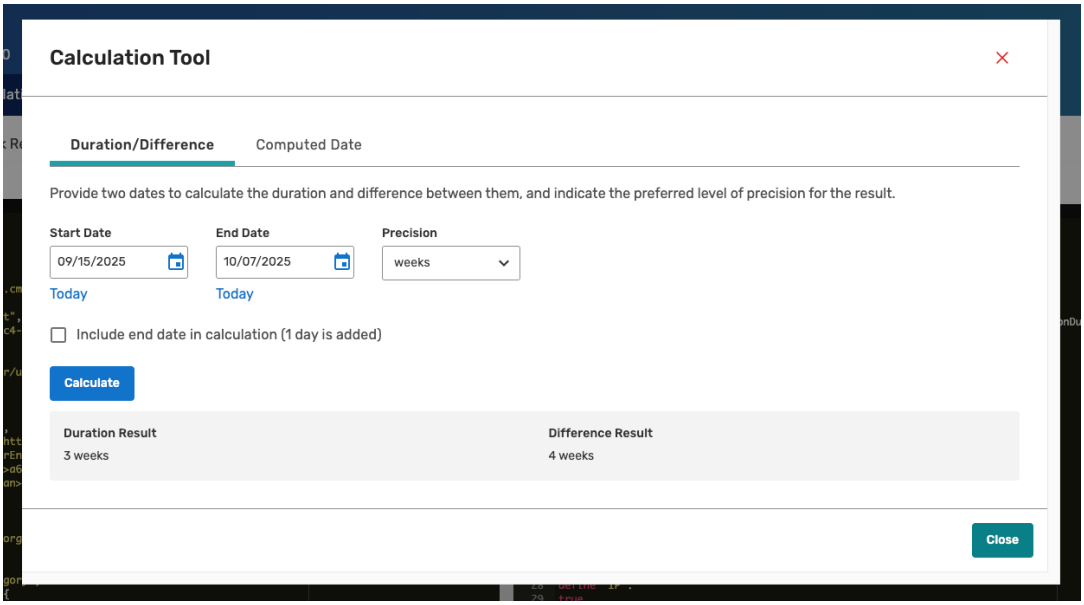


Image: Duration/Difference Date Calculation Modal

9.5.4.2 Computed Date

The Computed Date tab lets you calculate a new date by adding or subtracting a time interval from an initial date. Start by selecting the Initial Date, then choose whether to (+) Add or (-) Subtract**.** Enter the interval you want to compute then select the unit, such as Days**,** Weeks**,** Months**,** or Years**.**

Click "Calculate" to perform the date math. The tool will display the resulting date based on your selected operation and interval, making it easy to compute future or past dates without manual calculations. After the date has been completed, users can copy the date out of the modal to paste into MADiE or another tool you may be using.

See the screen shot below for an example of a compute date calculation with an Initial Date of 10/06/2025 and subtracting 3 weeks; the computed date is 09/15/2025.

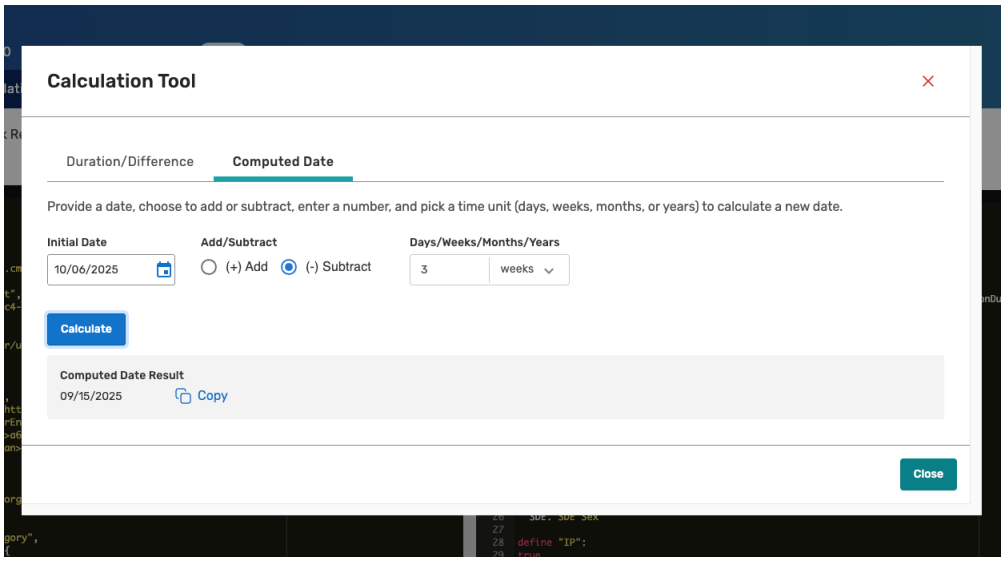


Image: Computed Date Calculation Tool

9.5.5 Logic Calculation Highlighting Information

This section is found on the right side of the edit test case screen. It contains four sections, Measure CQL (View-only), Highlighting, Expected/Actual, and Details. The Test Case Builder on the left-hand side can be used to build test cases. See section 9.5.3 for more information.

9.5.5.1 Measure CQL (View-only)

The right panel initially displays the measure CQL to aid in building the test case JSON. However, the measure CQL is view-only and cannot be edited in this area. CQL edits can only be made in the CQL Editor tab.

9.5.5.2 Highlighting

The Highlighting subarea (second link from the left in the right panel, next to the Measure CQL link) displays a test case's highlighting results calculated against the measure CQL. The highlighting subarea is view-only and cannot be edited. No highlighting will display until after clicking the "Run Test" button. Green and/or red highlighting is generated. Green highlighting indicates a passing result for any applicable lines of measure CQL, while red highlighting indicates a failing result for any applicable lines of measure CQL. Highlighting is broken down and displayed on separate tabs, one each for:

- Measure Populations (a list of the populations applicable to the measure)
- SDE (Only appears if the user has specified they want to include SDEs in the test case configuration)
- Definitions
- Functions
- Unused

Users can click through the tabs to get targeted highlighting information. If users would like to look at highlighting for a different Population Criteria, they will click the dropdown at the top of the section. It will open a list of Population Criteria, and users can select the population criteria they want to view. The “Run Test” button must be clicked each time a user would like to calculate new results.

The highlighting tab also contains a Results section for each definition. The Results section can be found directly below each definition and can be expanded and collapsed. It displays the results of the logic evaluated on the test case.

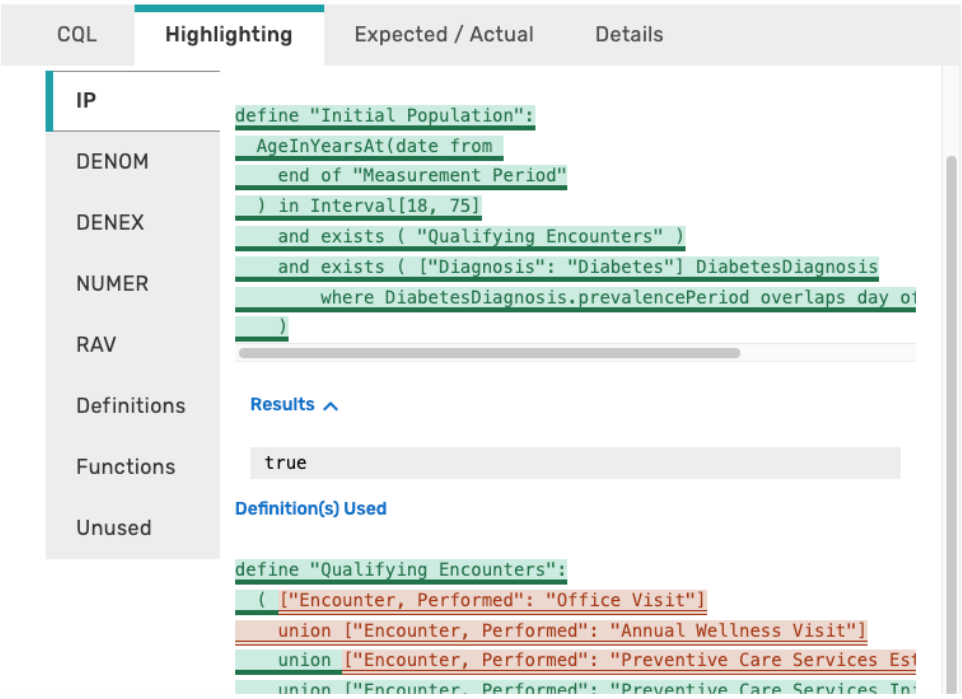


Image: Test Case Pass/Fail Highlighting

9.5.5.3 Expected/Actual

The Expected/Actual subarea (third link from the left, next to the Highlighting link, in the right panel) displays population criteria tables, where expected values for populations, stratifications, and observations within each set of population criteria can be configured. Upon clicking the “Run Test” button, Actual values are displayed along with pass/fail results for the test case across each set of population criteria. Updating the expected values will clear out any actual values that are displayed. Then the “Run Test” button must be clicked each time a user would like to calculate new results.

9.5.5.4 Details

The Details subarea (last link the right panel, next to the Expected/Actual link) displays:

1. **Title:** The Title field is the current name of a test case.
2. **Description:** The Description field communicates what a test case is testing and is auto populated with any Description field content entered during the creation of the test case. **Note:** Description can only contain 250 characters.
3. **Test Case Group:** The Test Case Group field assigns a test case to a group that can be used to sort and organize the test case table according to a user's preferences. It is auto populated with any Test Case Group assignments entered during the creation of the test case.

9.5.6 Deleting Test Cases

9.5.6.1 Deleting an Individual Test Case

After a test case has been created, it can be deleted by clicking on the test case's select button in the test case table. Then select "Delete." A confirmation dialog is shown. Select "Cancel" to continue editing and "Delete" to permanently remove the test case. **Note**: Deleting test cases cannot be undone.

9.5.6.2 Deleting All Test Cases on a Measure

To delete all the test cases on the measure, select "Delete All" in the upper right of the test case table. A confirmation dialog is shown. Select "Cancel" to continue without deleting any test cases and "Yes, Delete" to permanently remove all the test cases associated with the measure. **Note**: Deleting test cases cannot be undone.

If users want to reset Case # on their test cases, they can do so by completing the steps to delete all test cases. When adding the test cases back in, Case # will begin at zero again.

9.5.7 Copy Test Cases to Another Measure

MADiE allows users to select one, many or all test cases in a measure and copy them to another measure of the same model and model version. First, navigate to the test case page containing the test cases the user wishes to copy. Next select one, many or all test cases to copy. Select the copy icon in the test case action center. This will pop-up a Copy To modal. This modal will contain a list of measures that are eligible to copy the test case(s) to. The user must own or have share access to the measure and it must be the same model and model version.

To complete the copy to process, select the measure to copy to, and select "Save." A copy of the test case(s) will be added to the test cases on the selected measure. If the population criteria on the target measure do not match the populations on the initial measure, then the test case expected values will not be copied, and the user must navigate to the target measure and set the expected values.

9.5.8 Include Supplemental Data Elements in Test Case Calculation

MADiE will allow users to specify if they would like to include Supplemental Data Elements (SDE) in the test case calculation and code coverage highlighting. To include SDEs in calculations locate the Configuration section on the left had side of the Test Case List page. Select the SDE tab. Update the "Include Supplemental Data" radio button to "Yes." Click Save. The SDEs will now be included in the calculation and coverage percentages. You can specifically see the SDE highlighting on the Highlighting tab of the edit test case page.

Users that do not want to include SDEs in the measure calculation verify that the "Include Supplemental Data" radio button is set to "No."

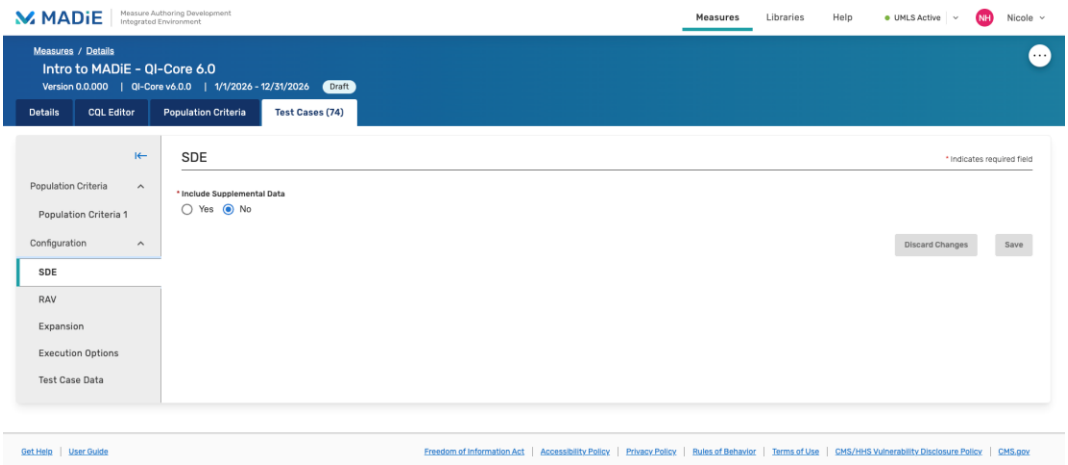


Image: Include Supplemental Data Elements Tab

9.5.9 Risk Adjustment Variables in Test Case Calculation

MADiE will allow users to specify if they would like to include Risk Adjustment Variables (RAV) in the test case calculation and code coverage highlighting. To include RAVs in calculations, locate the Configuration section on the left-hand side of the Test Case List page and select the RAV tab. Update the "Include Risk Adjustment Variables" radio button to "Yes" and click "Save." The RAVs will now be included in the calculation and coverage percentages. You can specifically see the RAV highlighting on the Highlighting tab of the edit test case page.

Users that do not want to include RAVs in the measure calculation verify that the "Include Risk Adjustment Variables" radio button is set to "No". **Note**: for new measures MADiE defaults the Risk Adjustment Variable setting to "Yes" or include RAVs.

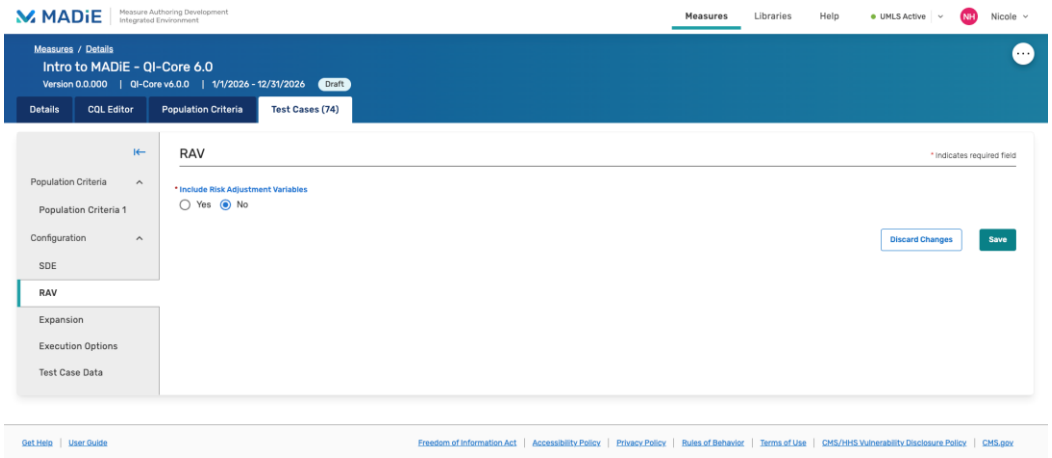


Image: Include Risk Adjustment Variables Tab

9.5.10 Expansion Manifest Selection

MADiE allows users to specify a Manifest to use with their measure's test case execution. To specify a Manifest, select the "Expansion" under the Configuration subtabs on the Test Case Tab. Here required radio buttons are available to select one of two options:

- **Latest** - this option uses the latest version of each value set available in VASC. **Note:** This option includes value sets in a draft status and with inactive codes.
- **Manifest** - this option allows a user to select a specific manifest available in VSAC **Note:**
    - VSAC Draft Manifests include value sets in a draft status
    - VSAC Active Release Manifests do not support draft value sets

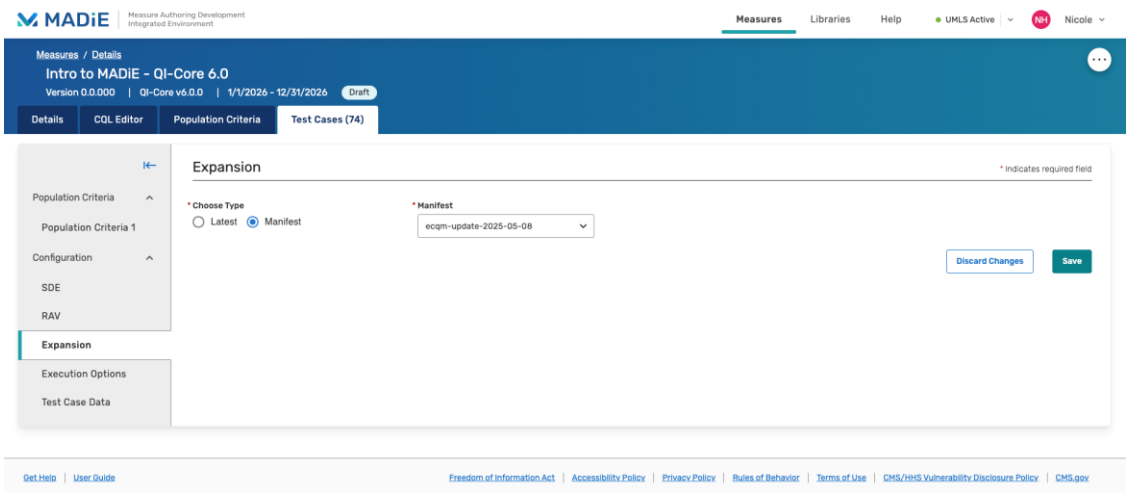


Image: Expansion Tab – Manifest Selected

9.5.11 Execution Options

In some cases, a user may want to execute test cases even if they have a “Pending” or “Invalid” validation status on one or many test cases. It is important to note that executing invalid test cases can produce inaccurate pass/fail results so users should evaluate if executing invalid test cases is the best choice for their workflow. This can be accomplished via the Execution Options tab on the test case tab. Users can navigate to the Execution Options tab and select the “EXECUTE TEST CASES REGARDLESS OF VALIDATION STATUS” checkbox and click save. A warning banner will now be displayed on the test case list page making users aware that the pass/fail results may not be accurate since pending and invalid test cases are being executed. **Important note**: In some instances, such as when a test case is syntactically invalid, test cases will still not be able to be executed even with this setting being enabled.

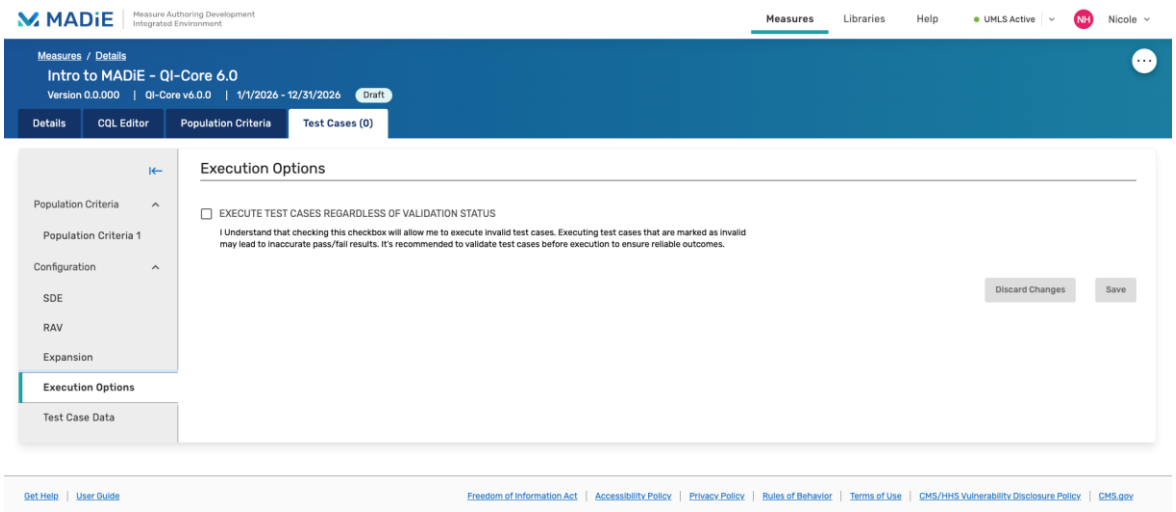


Image: Execution Options

9.5.12 Test Case Data

The test case data subtab is where users can shift test case dates for all test case in the measure. This feature will allow users to shift the test case dates year a specified number of years. For example, if a test case has a date of birth of 5/13/1976, a user can shift test case dates forward five years and the test case date of birth will be updated to 5/13/1981. This feature will be beneficial if the measurement period used for the measure is updated and all test case dates need to shift to fall within the measurement period.

9.5.12.1 Shift All Test Case Dates

To shift all test case dates, enter a number in the Shift Test Case Dates text area. This number can be positive to shift test case year forward, or negative to shift test case years backwards. After entering the number of years to shift dates in all test cases click “Save.” MADiE will

attempt to shift all test case dates the specified number of years. If some test cases cannot be shifted, MADiE will skip those and provide a message indicating those dates could not be shifted. If all dates could successfully be shifted, then MADiE will display a success message.

If the date being shifted is February 29th and the date is shifted to a non-leap year, the date will become February 28th in the new year. For example, 2/29/24 shifted one year will become 2/28/25.

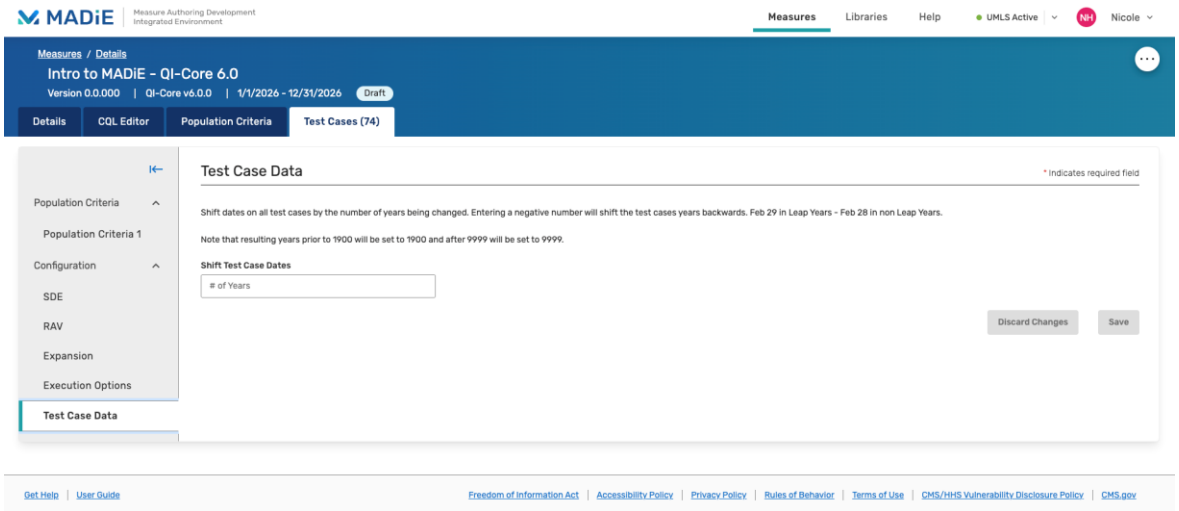


Image: Test Case Data Subtab

9.5.12.2 Shift Single Test Case Dates

MADiE also allows users to shift all dates in a single test case. This feature would be useful if users import test cases from another measure and need to update the test case dates to fall into the measure's measurement period.

To shift all dates in a single test case, locate the test case on the list page. Open the action item dropdown and select "Increment Dates." A modal will pop-up displaying the test cases Group and Title. Ensure the correct test case was selected enter the number of years the test case dates need to be shifted in the text area. This number can be positive to shift the year used in the test case forward, or negative to shift the year used in the test case back. After entering the number of years to shift the test case dates click "Save." MADiE will attempt to shift all dates in the test cases the specified number of years. If the dates could be shifted a success message will be displayed, if the dates could not be shifted an error message will display.

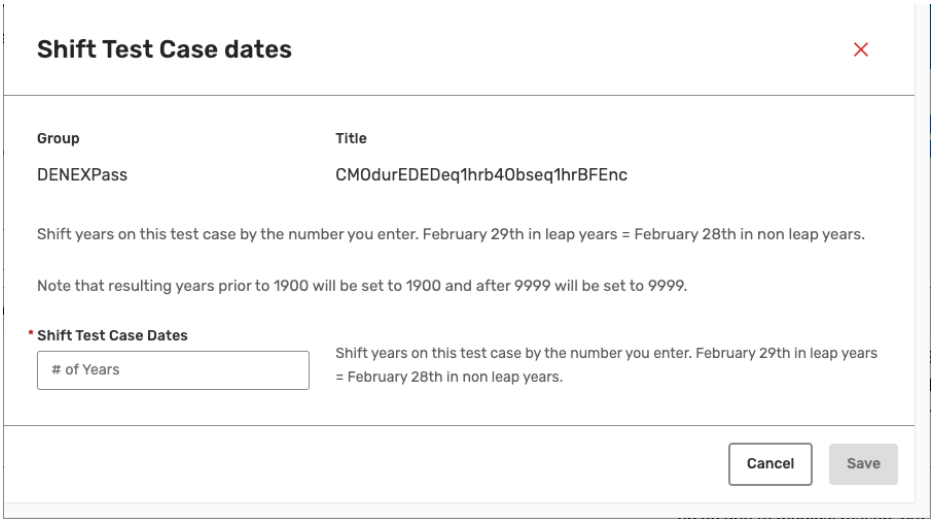


Image: Shift Test Case Dates - Single Test Case Date

9.5.13 Synchronize Test Case JSON with Test Case UI (QI-Core Only)

The Synchronize Test Case JSON with Test Case UI feature is available only for QI-Core measures where the user has edit access. This feature updates the patient's name fields in the JSON to match the values the user has entered in the Test Case UI. Specifically, the title will be used to set the given name field, and group will be used to set the family name field.

To use the feature, select one or more test cases in the Test Case List and click the puzzle piece icon in the action center. A confirmation modal will appear, indicating how many test cases were selected and explaining that all family fields in the JSON will be set to the group value entered in the UI, and all given fields will be set to the title value. If you wish to proceed, click "Yes, Make JSON Match UI."

During processing, any test case that is locked by another user, contains a JSON syntax error, or lacks patient family or given fields will be skipped because it cannot be updated. After the operation completes, a success message will appear if all selected test cases were updated successfully. If any test cases could not be updated, an error message will display a list of the affected test cases by group and title so you can review and update their JSON manually.

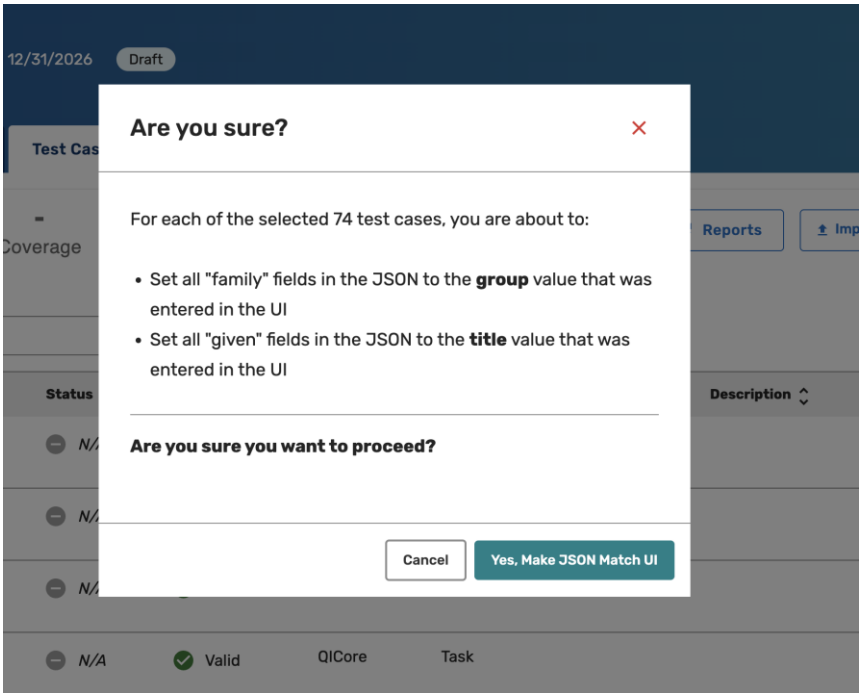


Image: Synchronize JSON and UI – Are You Sure Modal

9.6 Export QI-Core Test Cases

MADiE allows users to export QI-Core test cases as either transaction bundles or collection bundles. The test cases will be exported in a JSON format with information about the measure and expected values added into a Measure Report Resource in the JSON file.

9.6.1 Export Test Case(s)

To export Test Case(s), navigate to the test Case List Page. First, select the test case(s) you want to export, you can select one to all. Next, click the export Icon and select “Transaction Bundle” to export the test case(s) as a transaction bundle, or “Collection Bundle” to export the test case(s) as a collection bundle. A .zip file will be created with the PatientID for the test case(s) selected for export included in a folder name. The folder will contain the JSON file(s) for the test case(s). The zip file will also include a read me file linking the Case Number and PatientID to the Test Case Title and Test Case Group. In the read me file will also be the Case Number, test case ID, measure Group, and measure title of any test case that could not be included in the export because it was invalid. The image below shows the correct order of required steps to follow to export test case(s).

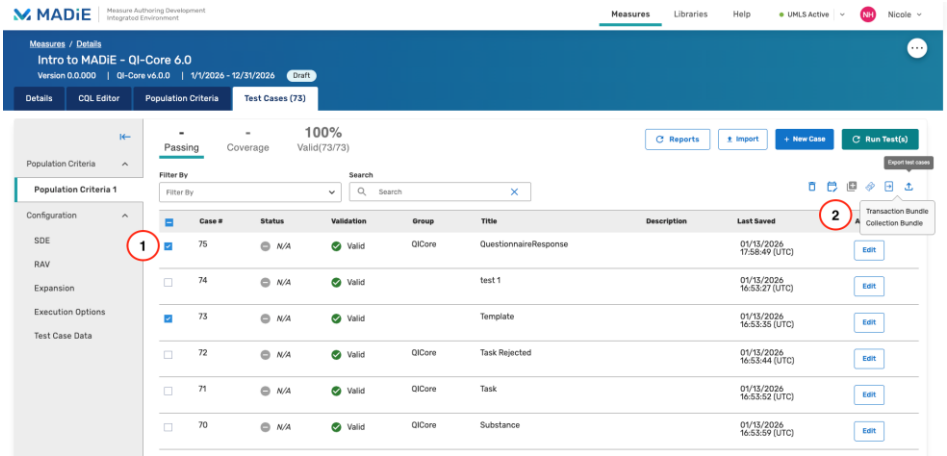


Image: Export QI-Core Test Case(s)

9.6.2 Export All Test Cases

To export all Test Cases associated with a measure navigate to the Test Case List Page and find the "Items per page" dropdown below the test case table. Select "All" from the dropdown. Next, scroll to the top of the test case table and click the select all checkbox. All test cases will now be selected. Finally, click the export Icon and select "Transaction Bundle" to export the test cases as a transaction bundle, or "Collection Bundle" to export the test cases as a collection bundle.
A .zip file will be created with a folder for each test case which includes the PatientID in the folder name. The folder will contain a JSON file for each of the test cases. The zip file will also include a read me file linking the PatientID to the Test Case Title and Test Case Group.

Image: Pagination – All Selected

9.7 Export QDM Test Cases

MADiE allows users to export QDM test cases as either an Excel format or a QRDA format. To export either format, navigate to the Test Case List Page, select "Run Test(s)," select "Export Test Cases" and then select the format needed. The image below shows the correct order required steps to follow to export all test cases. For QDM, the export button will export all test cases regardless of test case selection.

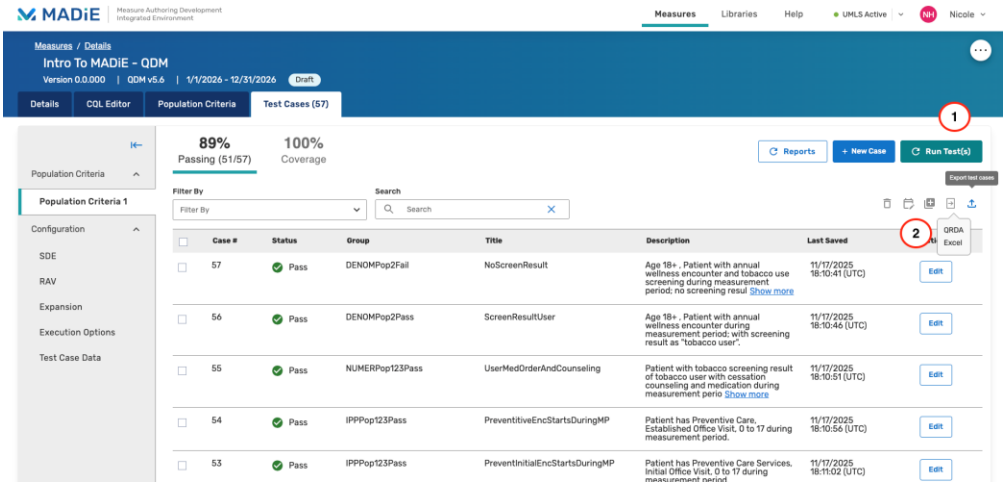


Image: QDM Test Case Export

9.7.1 Excel Export

When this format is selected an Excel file will be generated. The Excel file will contain a sheet titled “KEY” containing helpful information to understand the results and a sheet for each population in the measure. The population sheets will provide the expected and actual values, metadata about the test case, and results for every definition in the CQL.

9.7.2 QRDA Export

When this format is selected a zip file will be generated containing QRDA information about the test cases. The zip folder will include an “html” folder, containing an HTML file for each test case. The zip file will also contain a “qrda” folder, containing an XML file for each test case.

9.8 Import QI-Core Test Cases

MADiE allows users to import one to multiple test cases for a measure that were previously exported from MADiE, see section 9.6.2 to learn how to export test cases from MADiE. Follow these steps to import multiple test cases for a measure:

1. Log in to MADiE and open the measure you wish to import the test cases to.
2. Navigate to the Test Case(s) tab.
3. Click the “Import” button (see image below).
4. A Test Case Import screen will appear. Click the “Select Files” button.
5. MADiE will prompt you to select a file using the browser’s default selector.
6. Select and open the .ZIP file containing the test cases exported from MADiE. The structure of the file must be retained from the MADiE export (that is the ZIP file shall contain one folder for each test case whose name is the PatientID for that test case, and

each folder shall contain one JSON test case file. A .madie file containing metadata on each test case will also be present).

7. Once you have selected a valid test case .ZIP file, click the "Import" button.
8. MADiE will replace the existing test case JSON with the imported JSON for all test cases whose PatientID's match. Measure report information such as expected and actual values will not be updated during the import process for existing test cases, users will need to manually update those after the import is complete. Test cases that do not have a matching PatientID in the current measure will be imported as new test cases on the measure, including expected values. **Note:** The combination of Title and Group must be unique for the measure. Test cases that fail to import due to the Title and Group not being unique to the measure will be listed after the import processing is complete.

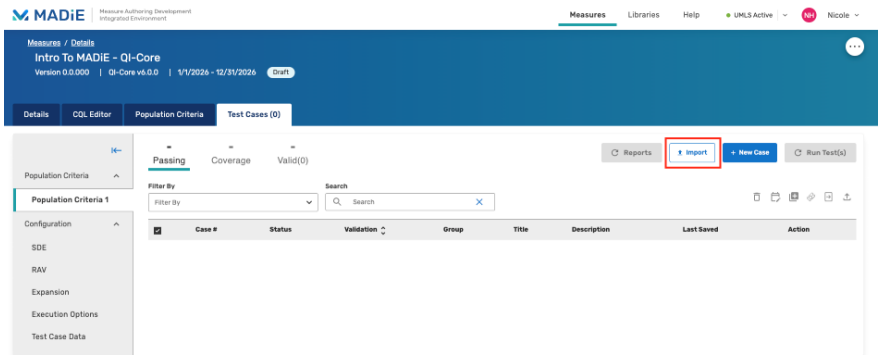


Image: QI-Core Test Case Tab – Import Test Cases from MADiE Button

Should the measure populations not match, expected values are not copied over, and a warning message will be displayed. Users can select the "Copy Test" icon, see screenshot below. Doing so will copy the warning and the test case IDs allowing users to copy it into a word document. This will allow users to see the test cases more easily they need to update to import expected values.

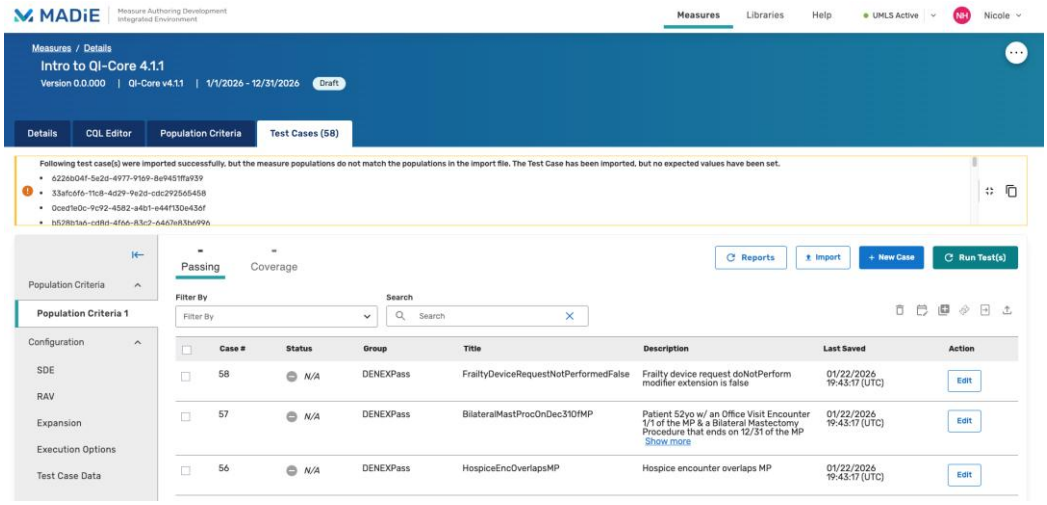


Image: QI-Core 4.1.1 Test Case Import Warning Message

9.9 Overlapping Codes

Overlapping codes are codes that are used in more than one value set included in the measure or included library. To see the report of all of these codes in the measure, first open the measure and navigate to the test case list page. There will be a “Reports button,” clicking it will display all the reports available in MADiE. Select “Overlapping Codes” and the overlapping codes report will pop-up.

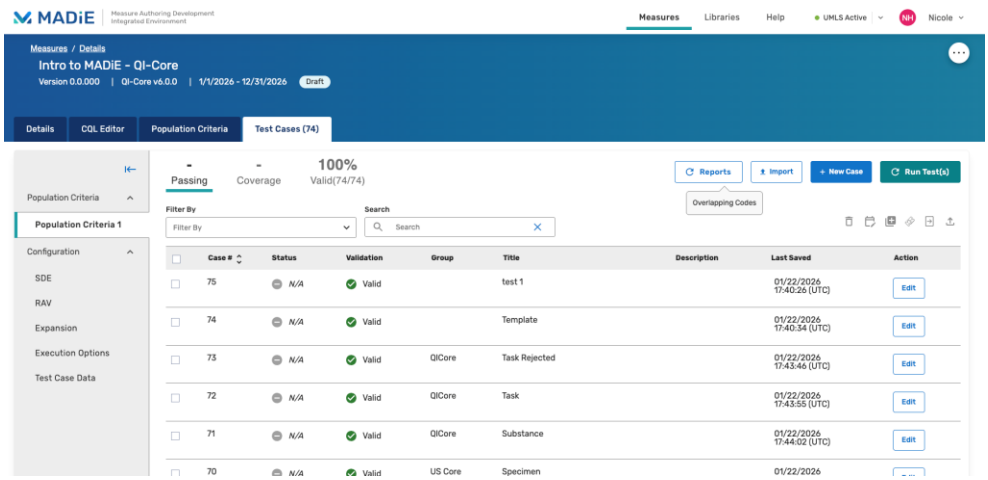


Image: Overlapping Codes Report

The Overlapping Codes report is a modal that displays the Code, Code System, Description, and Version of the different overlapping codes. Each code can be expanded to see the value sets that it belongs in. Once expanded the Value sets and OIDs containing the code will be displayed.

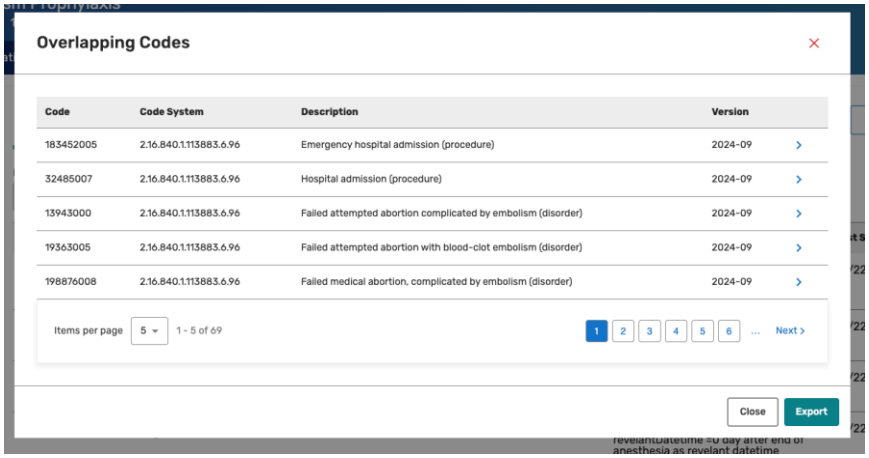


Image: Overlapping Codes Modal

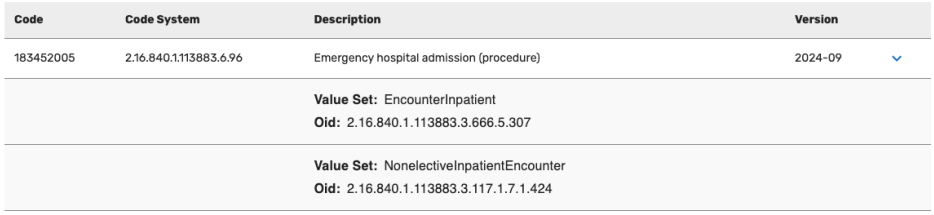


Image: Expanded code

This report can also be exported by clicking the "Export" button at the bottom of the modal. This will place the overlapping codes in an excel file that is downloaded to the user's computer. To exit the report, click "Close" or the "x" in the top right of the modal.

9.10 Measure and Test Case Locking

MADiE uses a locking mechanism to prevent conflicting edits on measures, test cases, and libraries. When a user edits a measure, the measure is locked for other users. A measure becomes locked when a user clicks "Edit" from any measure list or navigates to a measure via a direct URL, provided they have edit access and the measure is not already locked by another user. The measure remains locked while the user is on the Details, CQL Editor, or Population Criteria tabs. The measure lock is released when the user navigates to the Test Cases tab, returns to the measure list or libraries workspace, logs out, or is timed out. Locks are also cleared when users log out, times out, or logs back in after unexpected events. When a measure is locked, users with edit access will see the "Edit" button replaced by a "View" button with a lock icon and a tooltip stating, "Locked while being edited by *{username}*." Users without edit access will see no change in MADiE functionality when the measure is locked. While locked, the measure is view-only for all other users.

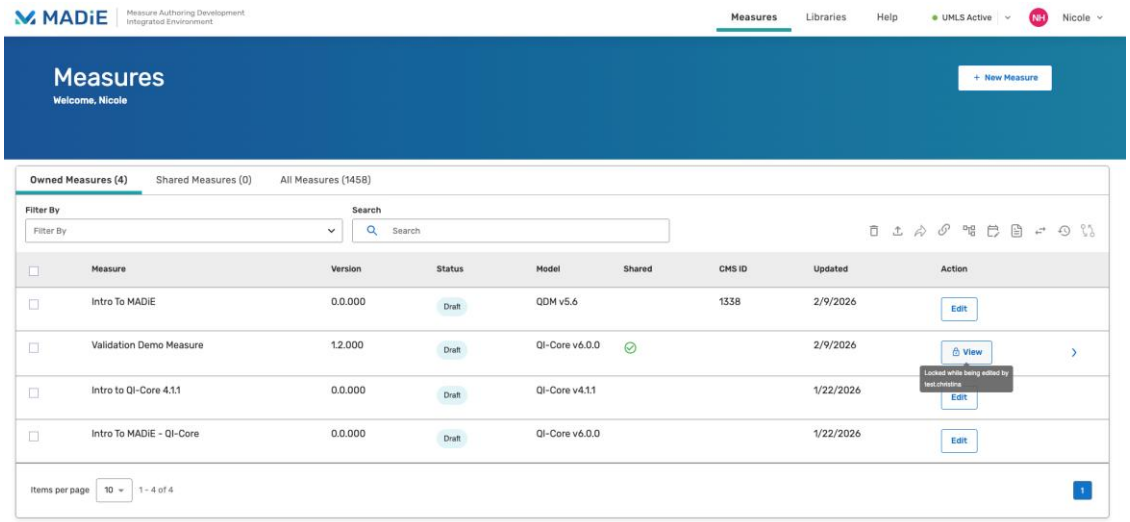


Image: Measure List Page – Measure Locked

Additionally, when a user with edit access is viewing any measure detail screen, "In-Use" with a lock icon will display in the header, showing the same tooltip. Users can still manage test cases while a measure is locked, including adding, importing, editing, deleting, cloning, copying, exporting, running, and shifting dates. If an import would overwrite locked test cases, a warning message will appear. If a user attempts to edit a locked measure, a pop-up will appear notifying them that the measure is locked and that they have view-only access.

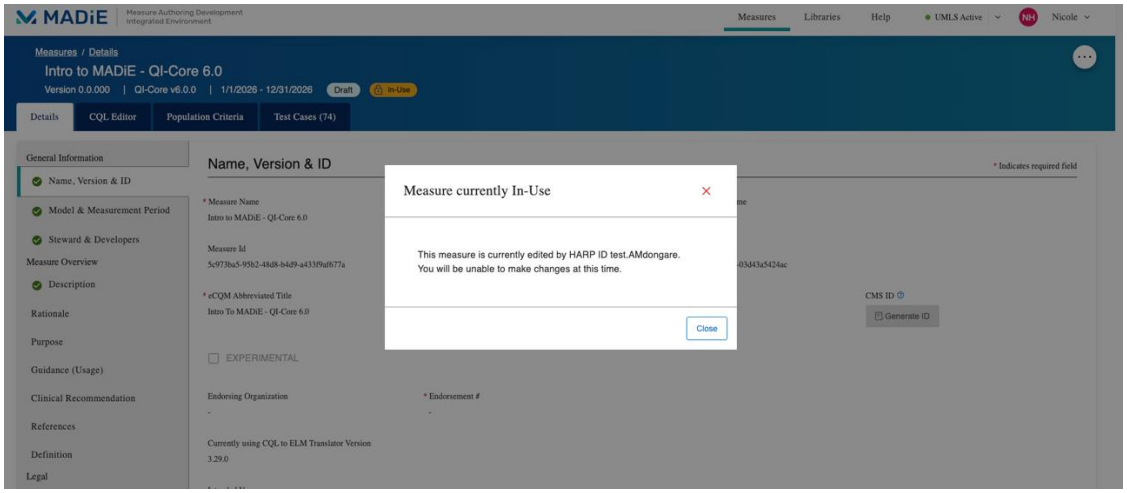


Image: Measure Details Tab – Measure Locked by Another User

For test cases, locking applies only to the specific test case being edited. A test case becomes locked when a user clicks "Edit" from the test case list or navigates to it via a direct URL, provided the user has edit access and the test case is not already locked by another user. The lock remains while the user is on the test case edit screen and is released when they navigate to a

different test case, return to the test case list, navigate to the Details, CQL Editor or Population Criteria tabs, leave the measure, log out, or time out Other test cases and the measure remain unlocked and editable. If a user with edit access tries to edit a locked test case, the "Edit" button changes to "View" with a lock icon and tooltip, "Locked while being edited by *{username}*." Users without edit access see no change in MADiE functionality when locked by another user.

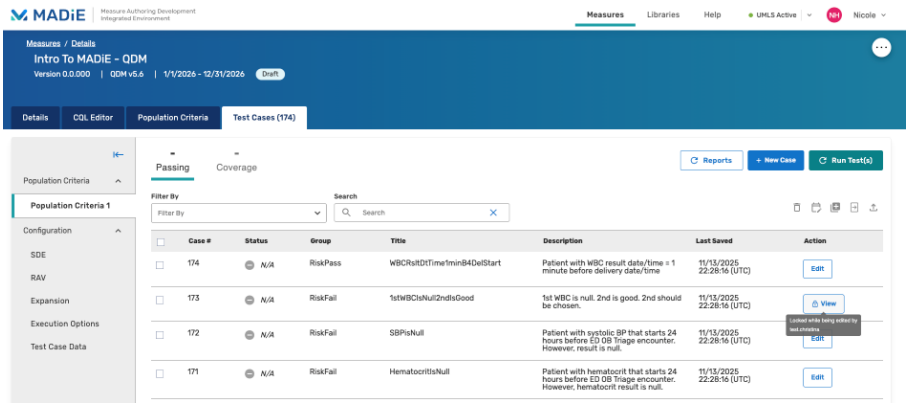


Image: Test Case List Page – Test Case Locked

If a measure is updated while a user is editing a test case, a message appears notifying the user: "This measure has been updated by *{username}*. This may cause unexpected results in this test case. It is recommended that you save your work and refresh the page." If a user attempts to edit a locked test case, a pop-up will appear notifying them that the test case is locked and that they have view-only access. Locks are also cleared when users log out, times out, or logs back in after unexpected events.

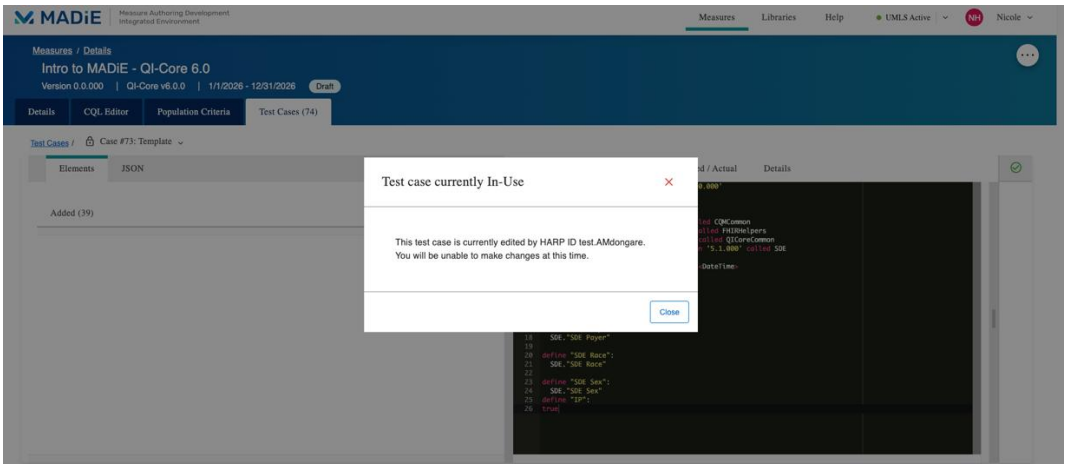


Image: Test Case Tab – Test Case Locked by Another User

10 Measure Export

MADiE allows for most measures, QDM and QI-Core, to be exported by any user. To export a measure, navigate to the Measure List Page, and use the search function to find the measure you want to export. Check the checkbox of the correct measure and click the "Export" icon. A dropdown will appear allowing users to select "Export" and "Export for Publishing" based on the purpose of the export. The Export option will provide additional errors, warnings, and information that could be useful to understand the measure. This could be particularly useful during a measure review period. The Export for Publishing option will provide a clean export with no errors, warnings, or extra information, allowing the focus to be the measure content.

At this time, only one measure can be exported at a time. A loading message will appear as MADiE generates the Export files. Measures do not need to be versioned to export but the measure needs to have the Measure Description, Measure Developers and Measure Steward populated, no errors in the CQL and the population criteria must be filled out. Test cases do not factor into the ability to export a measure. If a measure can't be exported an error message explaining the issue will display. If a measure is successfully exported a success message will display and a zip file containing the measure package will be downloaded to the user's computer.

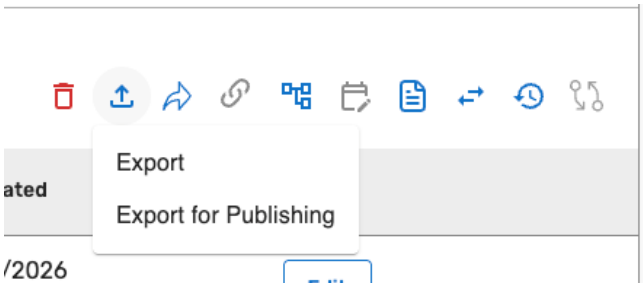


Image: Measure Export Options

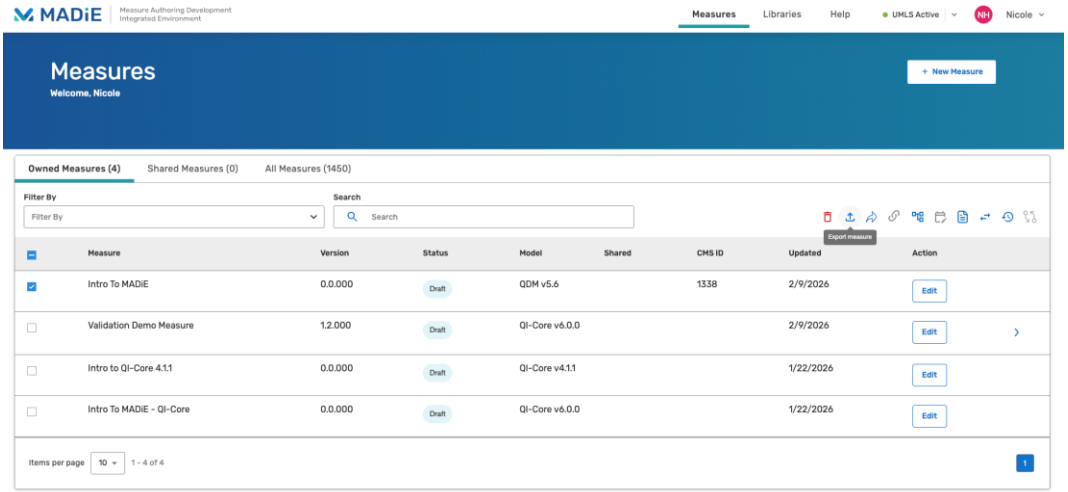


Image: Export Measure Functionality

10.1 QDM Exports

10.1.1 Files in Export

At this time MADiE only exports measures and included library data. No test case data is exported with the measure. The following files are included in the export zip file:

1. **Measure HTML**: This is the human readable representation of the measure.
2. **Measure HQMF**: The HQMF representation of the measure.
3. **CQL Folder**
    a. **Measure CQL**: The CQL the user entered for the measure.
    b. **CQL for all Included Libraries**: The CQL for any library that was included in the measure.
4. **Resource Folder**
    a. **JSON file for all included libraries**: The JSON representation of any included library. These files will be prepended with "library."
    b. **XML file for all included libraries**: The XML representation of any included library. These files will be prepended with "library."
    c. **JSON file for the measure resource:** The JSON representation of the measure resource. These files will be prepended with "measure."
    d. **XML file for the measure resource:** The XML representation of the measure resource. These files will be prepended with "measure."

10.1.2 File Naming Convention

The following naming convention is how MADiE names the QDM export files:

- Zip File: {eCQM Abbreviated Title}-v{MeasureVersion}-QDM .zip
- HTML File: {eCQM Abbreviated Title}-v{MeasureVersion}-QDM .html
- HQMF File: {eCQM Abbreviated Title}-v{MeasureVersion}- QDM .xml
- Measure CQL: {eCQM Abbreviated Title}-{MeasureVersion}.cql
- Included Library CQL: {libraryName}-{libraryVersion}.cql
- Included Library JSON: {libraryName}-{libraryVersion}.json
- Included Library XML: {libraryName}-{libraryVersion}.xml

10.2 QI-Core Exports

10.2.1 Files In Export

At this time MADiE only exports measure and included library data. No test case data is exported with the measure. The following files are included in the export zip file:

1. **Measure HTML**: This is the human readable representation of the measure.

2. **Measure JSON**: The JSON representation of the measure.
3. **Measure XML**: The XML representation of the measure.
4. **CQL Folder**
    a. **Measure CQL**: The CQL the user entered for the measure.
    b. **CQL for all Included Libraries**: The CQL for any library that was included in the measure.
5. **Resource Folder**
    a. **JSON File for All Included Libraries**: The JSON representation of any included library.
    b. **XML File for All Included Libraries**: The XML representation of any included library.

10.2.2 File Naming Convention

The following naming convention is how MADiE names the QI-Core export files:

- Zip File: {eCQM Abbreviated Title}-v{MeasureVersion}-FHIR.zip
- HTML File: {eCQM Abbreviated Title}-v{MeasureVersion}-FHIR.html
- JSON File: {eCQM Abbreviated Title}-v{MeasureVersion}- FHIR.json
- XML File: {eCQM Abbreviated Title}-v{MeasureVersion}- FHIR.xml
- Measure CQL: {eCQM Abbreviated Title}-{MeasureVersion}.cql
- Included Library CQL: {libraryName}-{libraryVersion}.cql
- Included Library JSON: {libraryName}-{libraryVersion}.json
- Included Library XML: {libraryName}-{libraryVersion}.xml

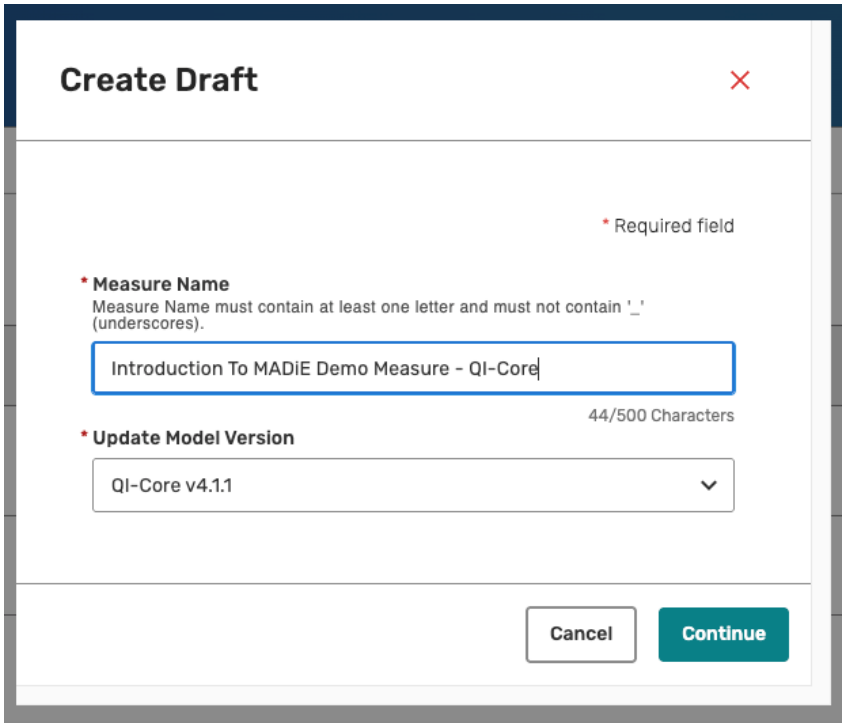
11 Model Version Updates (QI-Core Only)

MADiE supports multiple versions of QI-Core, specifically v4.1.1 and v6.0.0. Users can create new measures or libraries in either model version or up version to QI-Core 6.0.0 while drafting. Users should use the version that best fits their development needs. Only one draft version of a measure or library per model can be created at a time, regardless of version. This means users cannot actively work on a draft QI-Core v4.1.1 measure and a draft QI-Core v6.0.0 of the same measure. **Note:** After a measure or library has been created in the QI-Core v6.0.0 model, users will be prevented from drafting that measure or library in the QI-Core v4.1.1 model.

To update the model version, the measure or library must first be in a versioned status. If you need help with versioning a measure, see section 7.2 , or to version a library see section 14. Then follow the steps to begin to draft the measure or library. The Create Draft pop-up will allow users to update the measure name as well as the model version. It will default to the current model version. Users can select a different version from the dropdown. Clicking continue will update the measure model version, the using statement, and the test case validation used.

When a measure is updated to QI-Core v6.0.0, all associated test cases will automatically be added to the validation queue and validated against QI-Core 6.0.0 standards. This process runs in the background and will not interrupt any other work you are doing in MADiE. You can view the validation results on the Test Cases tab or within individual Edit Test Case pages. For additional details on QI-Core 6.0.0 test case validation, see section 9.5.3.5.

Important Note: MADiE does not auto convert any measure, library, or test case logic when the model version changes. Users will likely see errors in their CQL and Tests cases specifying things that need to be updated for the new model version.



Measure: Create Draft Modal

12 Measure Ownership

12.1 Viewing Measure Ownership in MADiE

In MADiE, the measure owner is displayed in several places to help identify who owns a measure. The Owned Measures tab does not show the owner because all measures listed there belong to the logged-in user. However, in the Shared Measures tab and the All Measures tab, an "Owner" column lists the first and last name of the measure owner for each measure. Additionally, when editing a measure, the Details tab displays the measure owner's name, ensuring clear visibility of ownership information throughout the application. If the first and last name of the measure owner cannot be displayed, a dash ("-") will appear in place of the name.

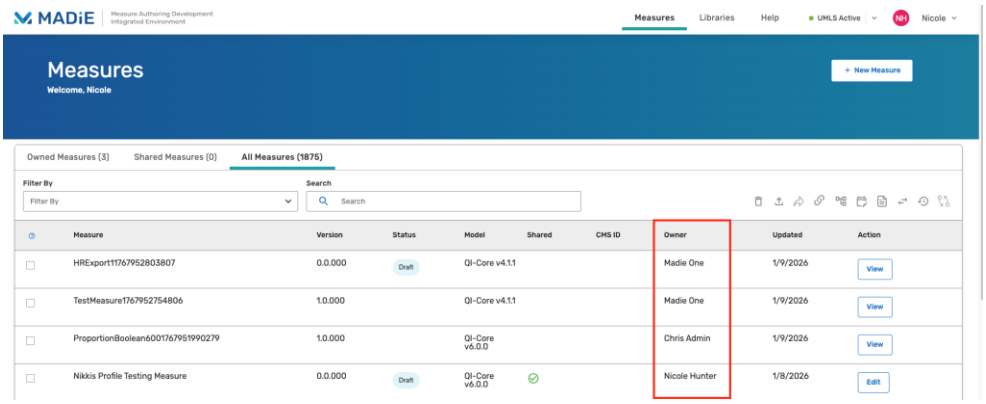


Image: All Measures Page- Measure Owner

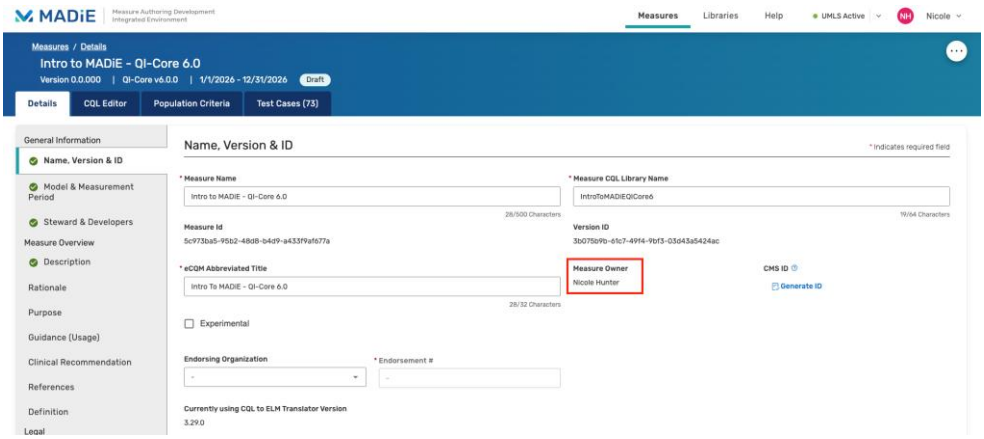


Image: Measure Details – Measure Owner

12.2 Adding or Removing Share Access for a Measure

MADiE allows users two options for adding or removing share access for a measure. Users can add or remove share access for measures they own directly in the UI. Users may also submit a request through the MADiE Help Desk.

12.2.1 Add or Remove Share Access Via MADiE UI

Users can share or unshare a measure in the MADiE UI. Before starting this process, the measure owner needs to have the HARP ids of the user(s) the measure is to be shared with or unshared with. Next, if users are on the measure list page, select all the measures to share or unshare and click the share icon. If on the measure edit screen, open the measure action center and click the share icon.

In both instances two options will be provided “Share With” and “Unshare.” To share, select “Share With.” A modal will appear listing the selected measures with expandable and collapsible

rows. Once expanded the rows will display who they are already shared with, and the date the measure was shared with them.

To share the measure(s) with a new user(s), type the user's HARP ID into the HARP ID field and click "Add User." This will add the user as a shared user for all measures shown in the table. To share the measure(s) with additional users, type the additional HARP ID for each user into the HARP ID field and click "Add User." To complete the share, click "Save." If the modal closes before "Save" is clicked, the updated share permissions will not take effect. **Note:** MADiE does not validate HARP IDs. If the user's HARP ID entered is not valid the measure will not be shared with the correct user.

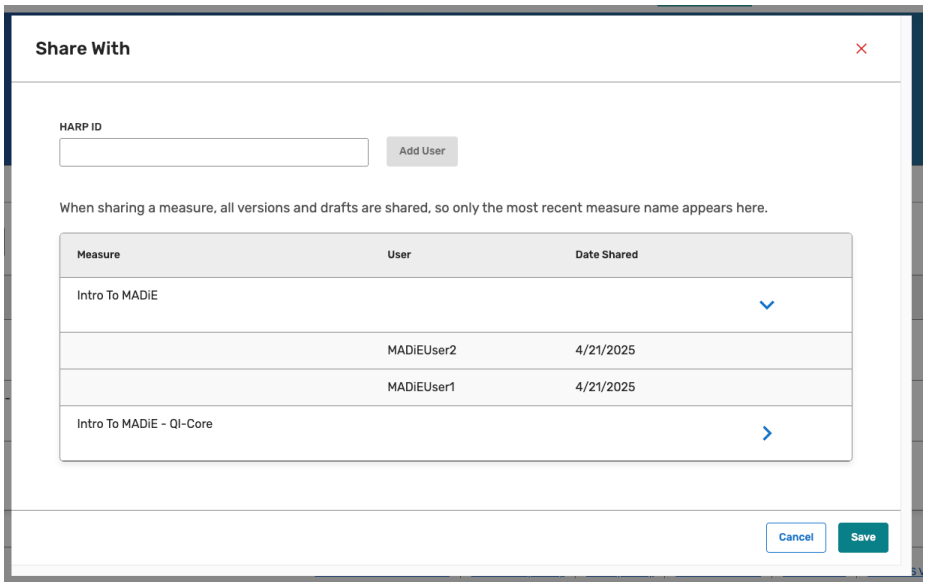


Image: Share With Modal

To Unshare with a specific user select the "Unshare" option in the dropdown. The unshare modal will appear. It will display the selected measures with expandable and collapsible rows. Once expanded each row will show the users shared with that measure, and the date they were shared. Each shared with user has a checkbox next to their row. To unshare with that specific user, uncheck the checkbox for the user(s) and click "Save." If the modal is closed prior to clicking "Save" the updated share request will not take effect.

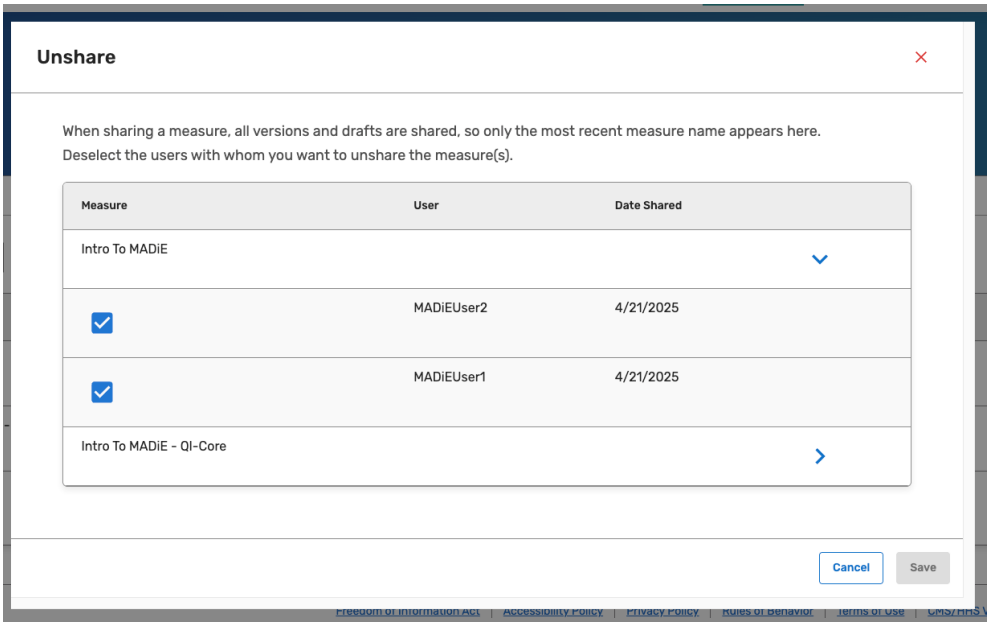


Image: Unshare Modal

12.2.2 Request Via Help Desk

To add share access to a measure and all test cases for the measure, the measure owner must complete the Share Request tab in the MADiE Add or Remove Measure and Library Sharing Request Form located on the Training & Resources tab of the public website and submit it via email to the Helpdesk at MADiE@cms.hhs.gov. To remove share access to a measure and all test cases for the measure, the measure owner or a user the measure is shared with must complete the Unshare Request tab in the MADiE Add or Remove Measure and Library Sharing Request Form located on the Training & Resources tab of the public website and submit it via email to the Helpdesk at MADiE@cms.hhs.gov.

**This form must be submitted via email and NOT submitted using the MADiE Jira Issue tracker as it contains HARP IDs

Please consider the following before submitting a request:

1. All existing and future measure versions and drafts will be shared or unshared.
2. Once a measure is shared or unshared, all of its test cases are also shared or unshared, since MADiE consolidates measure creation and testing functionality into a single tool.
3. Once a measure is shared, those who have access must coordinate to avoid overwriting each other's work. Overwriting prevention will not be immediately available and all users that the measure is shared with will have access to the measure and its test cases without restriction.

If you want to update who your measure is shared with, take the following steps:

1. Verify the measure ID in MADiE.
2. Review who the measure and test cases should be shared with
3. Collect the HARP IDs of the MADiE users with which the measure and test cases are to be shared or unshared.
4. Complete the MADiE Add or Remove Measure and Library Sharing Request form found on the MADiE public website
    a. For Sharing: complete the Share Request tab
    b. For Unsharing: complete the Unshare Request tab
5. Email the completed form to MADiE@cms.hhs.gov.mailto:

12.2.3 Unshare a Measure Shared with Me

In MADiE, users have the ability to unshare measures that were previously shared with them. This feature is especially helpful when transitioning between teams or when access to a particular measure is no longer needed.

To unshare a measure, begin by navigating to the Shared Measures tab. From there, select the measure or multiple measures you wish to remove from your shared list. Once selected, click the "Unshare" icon, then "Unshare" from the drop down. A confirmation modal will appear, displaying all the measures you've chosen to unshare along with your HARP ID.

At this point, you can either cancel the action by clicking "Cancel" or proceed by clicking "Accept". If you accept, the selected measures will be unshared, meaning you will no longer have edit access to them, and they will be removed from your Shared Measures tab.

This process ensures that your workspace remains relevant and streamlined, especially as your responsibilities or team affiliations evolve.

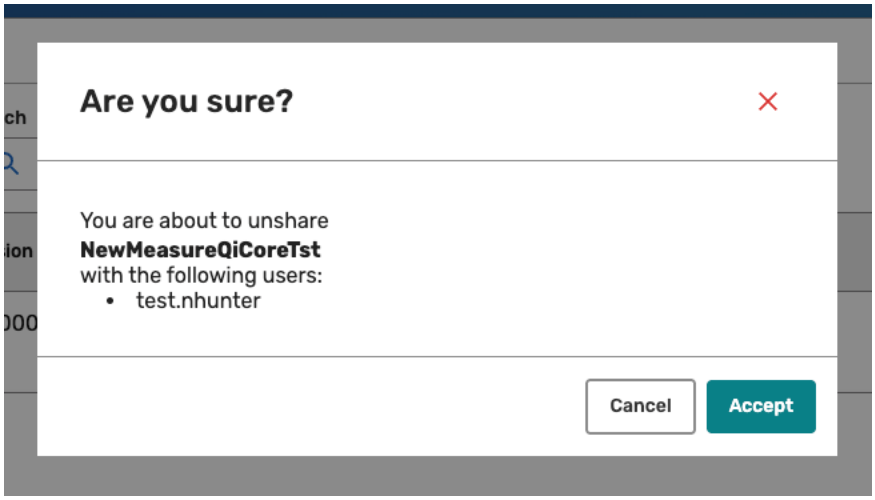


Image: Unshare Measure Shared With Me Modal

12.3 Transferring Measure Ownership

MADiE allows users two options for transferring measure ownership. Users can transfer measure ownership directly in the UI. Users may also submit a request through the MADiE Help Desk. This ensures teams can maintain continuity and collaboration as roles shift or responsibilities change.

12.3.1 Transfer Ownership in UI

MADiE allows users to transfer ownership of one or multiple measures at a time directly through the UI. To begin, users must first select the measure(s) they wish to transfer, then click the Transfer Measure Icon in the Measure Action Center. A modal will appear listing the selected measures. Enter the HARP ID of the user you want to transfer the measure(s) to. Finally click Transfer, the measures will then transfer ownership to the HARP ID of the user. **Note**: Entering an incorrect HARP ID will result in the measure being reassigned from the original owner to the incorrect HARP ID. This will prevent the intended owner from accessing the measure. Please double-check and ensure the correct HARP ID is entered.

Once the transfer is complete, the measure(s) will no longer appear in your Owned Measures tab, they will now appear in the new owners Owned Measures tab. If you wish to retain access to the measure after transferring ownership, check the Retain Share Access after Transfer box before confirming the transfer. This will allow you to continue editing the measure in the Shared Measures tab.

Note: Transferring measure ownership is a permanent action and cannot be undone. Please confirm the recipient's HARP ID carefully before proceeding.

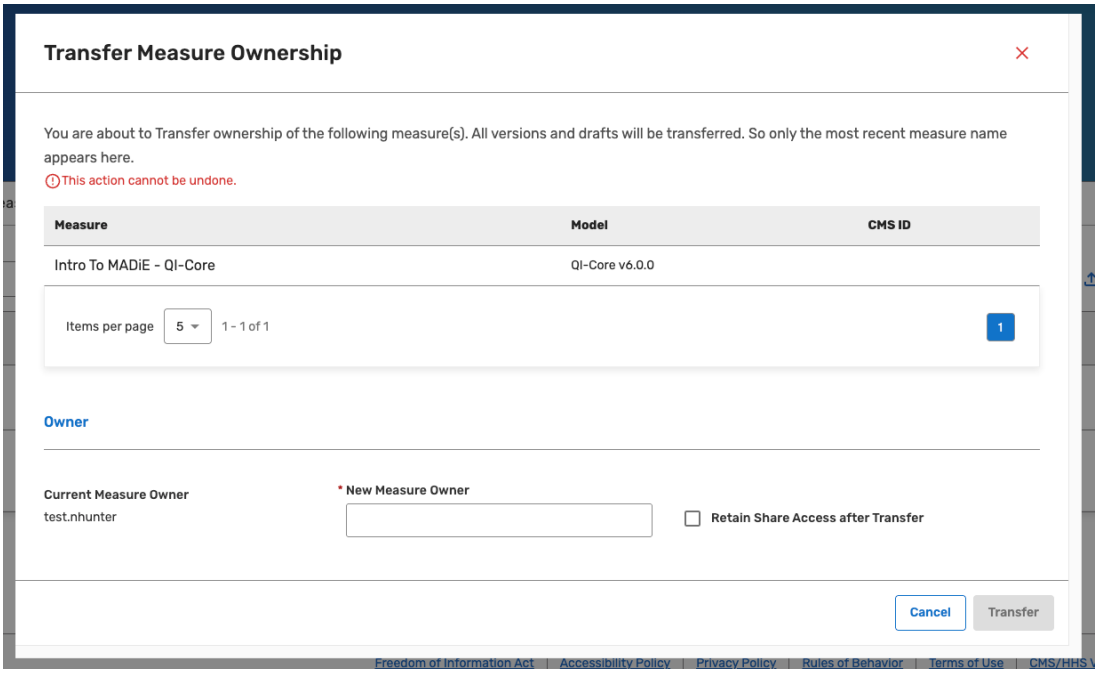


Image: Transfer Measure Modal

12.3.2 Request via Help Desk

To transfer a measure ownership and all test cases for the measure through the help desk, the measure owner must complete the MADiE Measure or Library Ownership Transfer Request Form located on the Training & Resources tab of the public website and submit it via email to MADiE@cms.hhs.gov. **This form must be submitted via email and NOT submitted using the MADiE Jira Issue tracker as it contains HARP IDs.

The current owner needs to approve the request to transfer, so it is recommended, when possible, that the current measure owner send the email request.

Once the request is processed, the new user will own the measure and all measure versions. The privileges of the initial owner are now passed to the new measure owner. The new measure owner will have the ability to draft, version, delete, and share. The initial owner will no longer have those privileges. All share privileges previously set will remain present.

12.4 Measure Ownership Permissions

The following table depicts different measure actions and what user has permissions to complete that action.

Measure Action	Owner	Shared User	No Share Access
View a Measure	X	X	X
View/Export Overlapping Valueset Report	X	X	X
Compare Measure Versions	X	X	X
Edit Measure Meta Data	X	X	
Edit Measure CQL	X	X	
Edit Measure Population Criteria	X	X	
View a Test Case	X	X	X
Edit Test Cases	X	X	
Shift Test Case(s) Dates	X	X	
Version or Draft a Measure	X	X	
Deleting a measure	X		
Export a Measure	X	X	X
Export Test Case(s)	X	X	X
Import Test Case(s)	X	X	
Link QDM to QI-Core Measure	X		
Generate CMS ID	X		
Share/Unshare a measure in MADiE UI	X		
Request Share access through the help desk	X		
Request Unshare access through the help desk	X	X	
Request Measure Owner Transfer through the help desk	X		

13 Composite Measure Support

At this time, MADiE does not support Composite Measures for QDM or QI-Core measures.

14 Libraries Overview Page

The Libraries Overview page displays all standalone CQL Libraries that have been added to MADiE and further organizes the CQL Libraries into tables in three areas: Owned CQL Libraries, Shared CQL Libraries, and All CQL Libraries. The Owned Libraries table displays a list of CQL Libraries you own; the Shared Libraries table displays libraries that have been shared with you, and the All Libraries table displays all CQL Libraries in the system. All three areas include:

1. **Filter By/ Search:** Fields utilized to search for a specific library. See section 14.1.3 for more details.
2. **Library selector:** Allows users to select one or more libraries.
3. **Library:** The Library Name column displays the name of a CQL Library.
4. **Version:** The Version column displays the assigned version number of the library.
5. **Status**: Libraries that are in draft state will display a blue "Draft".
6. **Model:** The Model column displays the model and model version of a CQL Library.
7. **Shared:** The "shared" column displays a green check mark if the library is shared with others. **Note**: This column does not appear on the Shared Libraries Tab.
8. **Updated:** Displays the date the library was last updated.
9. **Actions:** The Actions column provides one of two buttons based on user access to the library:
    a. **Edit**: Draft library the user owns or has share access to will have an Edit button. This allows users to open the library for editing.
    b. **View**: Versioned libraries or libraries the user does not own or have share access to will have a View button. This allows users to open the library for view-only access.
10. **Library Expansion Icon:** If a library has this icon, it indicates the library has additional libraries in the library set and they are grouped together. See section 14.1.2 for more details.
11. **Library Action Center**: Allows users to perform an action on a selected library. See section 14.1.1 for more details.

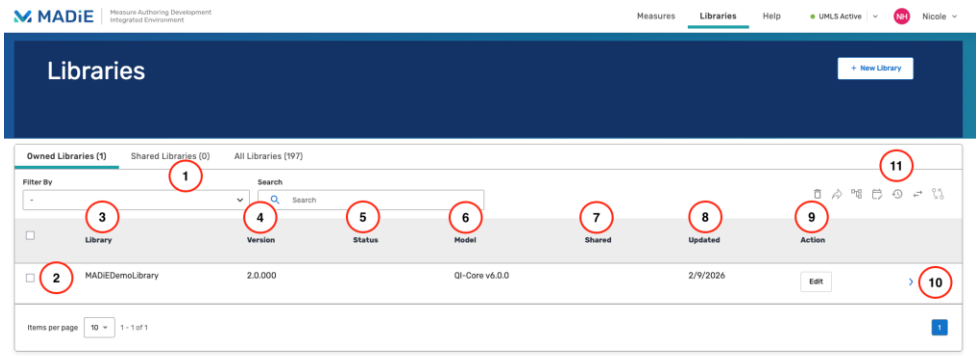


Image: Library Overview Page

A standalone CQL Library cannot be included into a measure unless it is in a versioned state. However, please note that once a standalone CQL Library has been versioned, it cannot be edited. To make any changes, a new draft of that standalone CQL library must be made.

14.1.1 Library Action Center

The library action center in MADiE is where users can take different actions on a library. First, select the library, then users can select an option by clicking the icons in the action center. The available actions are:

1. **Delete**: Allows users to delete the selected library. Only libraries in a draft status may be deleted. Engaging Delete library will display a modal confirming if you would like to remove the library. **Note:** Only the library owner can delete a library.
2. **Version**: Allows users to version the selected library. If the icon is disabled, the selected library is not available to be versioned.
3. **Draft**: Allows users to draft the selected library. If the icon is disabled, the selected library is not available to be drafted. This is also where users can update the model version the library utilizes (QI-Core only). See section 11
4. **View Library History:** This icon allows users to see information about the library history. See section 14.2.
5. **Share**: Allows users to share the selected library or libraries with other MADiE users. See section 17.2.1
6. **Transfer:** Allows users to transfer the selected library or libraries to another MADiE User. See section 17.3.1.
7. **Compare Library Versions:** This icon becomes enabled when two different library versions of the same library are selected and clicking it will display a popup detailing the differences between the library versions. See section 14.3 for more information.

Image: Library Action Center

14.1.2 Library Grouping

In MADiE, libraries that belong to the same library set, different versions of the same library, are now grouped together to improve organization and usability. Only the most recent library draft or version is displayed by default. This bundling allows users to easily view and manage related libraries in one place while reducing clutter on the library list.

On the library list page, bundled libraries are indicated by a library expansion icon to the right of the View or Edit button. Clicking this icon will expand the table to reveal all libraries within that set. This feature helps users quickly identify which libraries are part of the same set and navigate between them without leaving the page.

Bundling is based on shared libraries set identifiers, which link versions of a library together. This is especially useful for users working across multiple versions during development, testing, or validation workflows. Within each bundled group, libraries are sorted in descending version order, meaning the highest version number appears first. If a draft version of a library exists, it will automatically appear at the top of the list, making it easier to locate and work with the most current or in-progress version.

14.1.3 Library Searching

MADiE provides a flexible and intuitive search interface to help users locate libraries quickly and efficiently. At the top of the libraries list page, users will first see the Filter By dropdown, which allows them to narrow their search to a specific field: Library, Version, or Model.

Next to the filter, the search field allows users to enter keywords or identifiers. If no filter is selected, the system will search across all three fields simultaneously. If a filter is applied, the search will only return results based on the selected field. For example, selecting “Model” and entering “QDM” will return only libraries that are model type QDM.

When a matching library is found and it belongs to a library set, MADiE will return both the most recent draft version of the libraries and the specific version that matches the search criteria. This ensures users can view the latest working version alongside the exact match, supporting version comparison and development workflows. Additional measure versions will not display until the search criteria are removed.

Libraries within a set that match the search criteria, are organized in descending version order, with the highest version number appearing first. If a draft version exists, it will automatically appear at the top of the list.

14.2 Library History

The Library History feature allows you to view a detailed record of changes made to a library over time. To access it, select the Library History icon in the measure action centers. A modal will appear displaying the libraries history. Items in the history will include things like library creation details, date the library was created, times a library was versioned or drafted, other library updates, etc.

The measure history modal will include the following details:

1. **Date**: This is the date the library update occurred

2. **User Action:** This will display the update that occurred (e.g., CREATED, DRAFTED, CREATE_CMSID)
3. **HarpID:** the HARP ID of the user who performed the action
4. **Additional Info:** Contains any notes related to the update

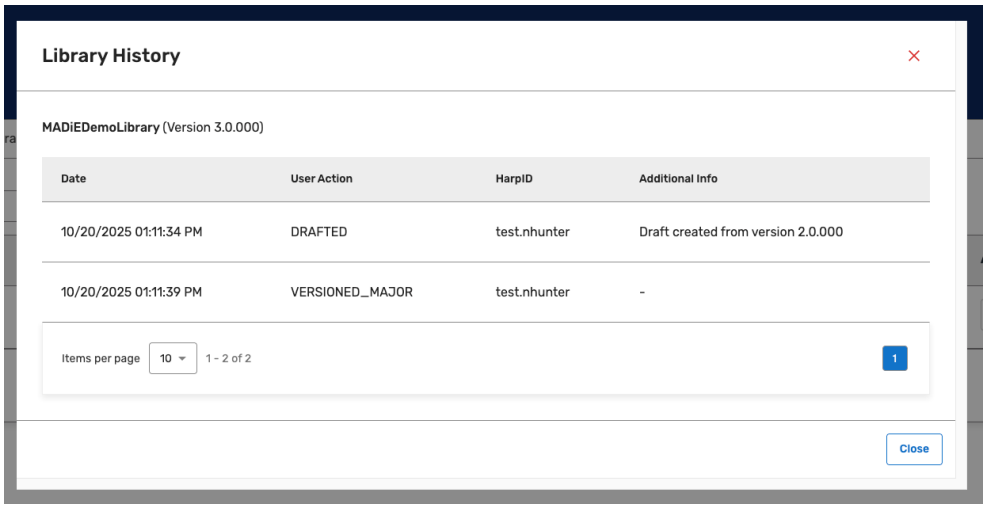


Image: Library History Modal

The modal is paginated for easy navigation through historical entries.

14.3 Compare Library Versions

The Compare Library Versions feature allows you to easily review the differences between two versions of the same library directly from the Library List. You can access it from any tab: Owned Libraries, Shared Libraries, or All Libraries. To begin, select any two versions of a library and click the Compare Library Versions icon. This opens a popup window that lets you evaluate version details, CQL changes, and library name updates in one place.

When the comparison popup opens, the header displays the title Compare Library Versions, followed by the name of the newest of the two selected library versions. The system identifies the newest version by the library with the greatest semantic version (major.minor.patch). If one of the selections is a draft, the draft is always treated as the newest and its name appears at the top. The CQL tab allows you to see the difference between the CQLs, and you may close the window at any time using the Close button.

The CQL tab presents a side-by-side view with an older version on the left and the newer version on the right. If both selected items are versions, the lower version number appears on the left and the higher version number appears on the right. If a draft is selected, the version always appears on the left and the draft on the right. Each side displays the library's version number (including a draft label when applicable) as well as the last updated date. This tab displays the full CQL code differences side by side so you can clearly see what changed between the two versions. Additions are indicated with

a "+" icon at the beginning of the row and highlighted green. Removed CQL is indicated by a "-" icon at the beginning of the row and highlighted red.

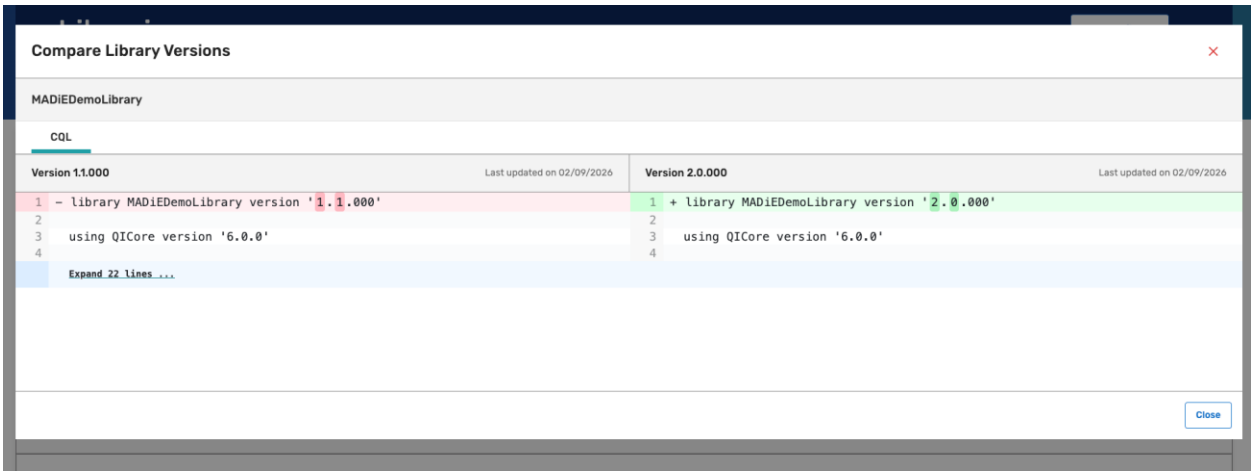


Image: Compare Library Versions - CQL

The comparison popup also highlights changes in the library's name using the same visual difference formatting. When you have finished reviewing the information, clicking the Close button returns you to the Library List.

15 Creating a New CQL Library

To create a new CQL Library, initiate the process by clicking on the "+ New Library" button in the upper right of the screen while on the Measures page. The New Library creation modal will appear, prompting you to enter the following information:

1. **Library Name:** The Library Name is the name of the standalone CQL library. The CQL Library Name must be unique within MADiE, start with an alpha-character followed by an alpha-numeric character(s) and must not contain spaces. **Note**: QDM measures will also allow underscores "_". Underscores can't be used in QI-Core measures as they are NOT valid for QI-Core.
2. **Model:** The Model dropdown assigns an available Model and Model version to the CQL library. QI-Core v4.1.1, QI-Core v6.0.0, and QDM v5.6 are currently available for library creation.
3. **Description:** The Description field describes the intent of the CQL Library.
4. **Publisher:** This is the organization responsible for the library content and maintenance. Choose the desired organization from the dropdown menu. **Note:** Organizations not included in the Publisher dropdown can be added by making a request to the MADiE Helpdesk.

Once the information above has been entered you have the option to:

1. **Cancel:** The Cancel button discontinues the creation of a new CQL library and closes the modal.
2. **Continue:** The Continue button saves the new CQL library using the information entered into the New Library creation modal and opens the newly created CQL Library for further editing.

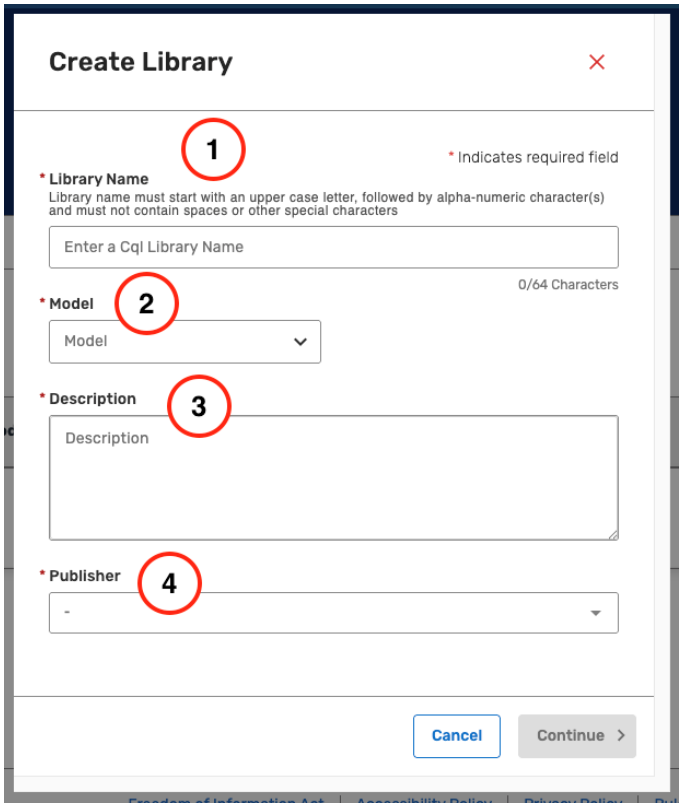


Image: Create Library Modal

16 Viewing & Editing a CQL Library

Upon opening an existing CQL Library or continuing from the New Library creation modal, the CQL Library content viewing/editing area is displayed. The viewing/editing area displays key content for the opened/newly created CQL Library and additional areas to further view/edit the rest of the CQL Library.

16.1 CQL Library Header

In the blue header, the following information and functionality about a CQL Library is displayed:

1. **CQL Library Name:** The CQL Library Name is displayed below the Navigation Breadcrumbs and above the Model, Model Version, and measurement period.
2. **Model & Version:** The model and model version are displayed below the CQL Library Name.
3. **Last Update Date:** The date when the CQL Library was last updated is displayed below the CQL Library Name and to the right of the model and model version.
4. **Navigation Breadcrumbs:** Above the CQL Library Name are navigation breadcrumbs, indicating what area of MADiE is currently displayed and providing a way to navigate back to the Libraries page.

16.2 CQL Editor (for Standalone CQL Libraries)

Below the blue header and in the left panel is the CQL Editor where a Standalone CQL Library logic including Parameters, Definitions, and Functions can be viewed and edited. All information except for the measure CQL Library Name and Version can be added, edited, and deleted.

All CQL must be entered in correct CQL syntax. When saving, any errors in the CQL will be displayed. CQL containing errors can be saved but may prevent dependent functionality from working properly (e.g., measures including the library). Make sure that the CQL is fully completed, and errors are resolved to ensure proper functionality.

16.3 CQL Library Details

Below the blue header and in the right panel are where the CQL Library Details can be edited, including:

1. **Library Name:** The Library Name is the name of the standalone CQL library. The Library Name displays the name entered when the CQL Library was created or last edited by anyone with access. CQL Library Names must be unique within MADiE, start with an alpha-character or underscore followed by an alpha-numeric character(s) or underscore(s) and must not contain spaces.
2. **Description:** The Description field describes the intent of the CQL Library.
3. **Publisher:** This is the organization responsible for the library content and maintenance. Choose the desired organization from the dropdown menu. **Note:** Organizations not included in the Publisher dropdown can be added by making a request to the MADiE Helpdesk.

4. **Experimental Checkbox:** The Experimental Checkbox can be selected if a CQL Library is Experimental.

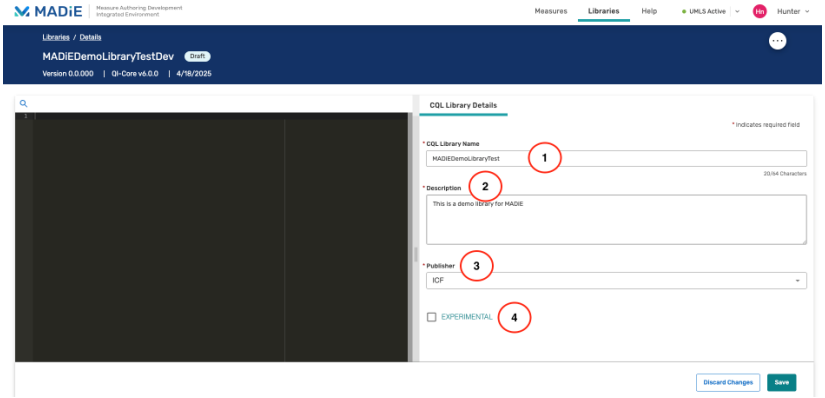


Image: CQL Standalone Library Workspace

16.4 Library Locking

MADiE uses a locking mechanism to prevent conflicting edits on libraries. When a user edits a library, the library is locked for other users. A library becomes locked when a user clicks "Edit" from any library list or navigates to a library via a direct URL, provided they have edit access and the library is not already locked by another user. The library remains locked while the user is on the library edit screen. The lock is released when the user navigates back to the library list or libraries workspace, logs out, times out, or logs back in after unexpected events. When a library is locked, users with edit access will see the "Edit" button replaced by a "View" button with a lock icon and a tooltip stating, *"Locked while being edited by {username}."* Users without edit access will see no change in MADiE functionality when locked by another user. While locked, the library is view-only for all other users.

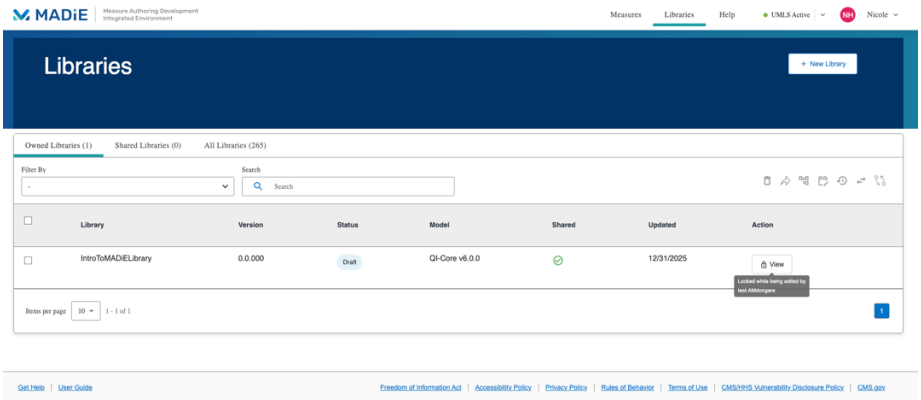


Image: Library List Page – Library Locked

Additionally, when a user with edit access is on the library detail screen, "In-Use" with a lock icon will display in the header, showing the same tooltip. If a user attempts to edit a locked library, a pop-up will display notifying them that the library is locked and that they have view-only access.

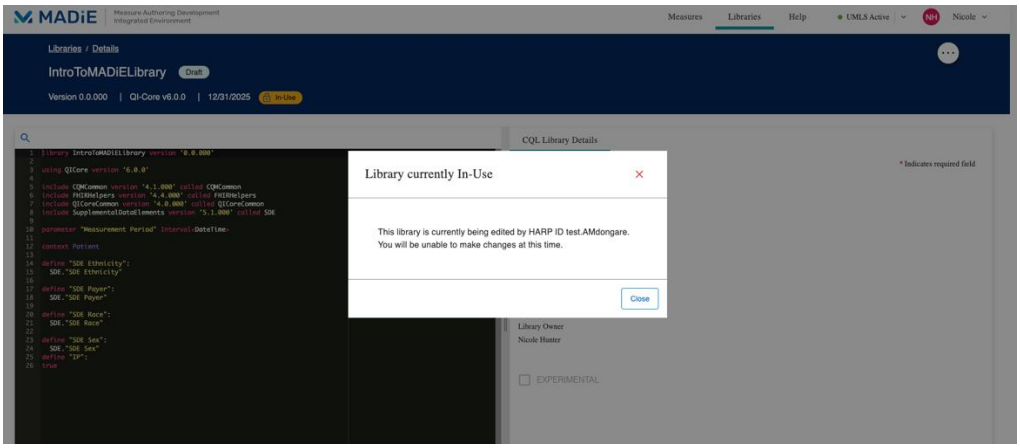


Image: Edit Library – Library Locked by Another User

17 Library Ownership

17.1 Viewing Library Ownership in MADiE

In MADiE, the library owner is displayed in several places to help identify who owns a library. The Owned Libraries tab does not show the owner because all libraries listed there belong to the logged-in user. However, in the Shared Libraries tab and the All Libraries tab, an "Owner" column lists the first and last name of the library owner for each library. Additionally, when editing a library, the Details tab displays the library owner's name, ensuring clear visibility of ownership information throughout the application. If the first and last name of the library owner cannot be displayed, a dash ("-") will appear in place of the name.

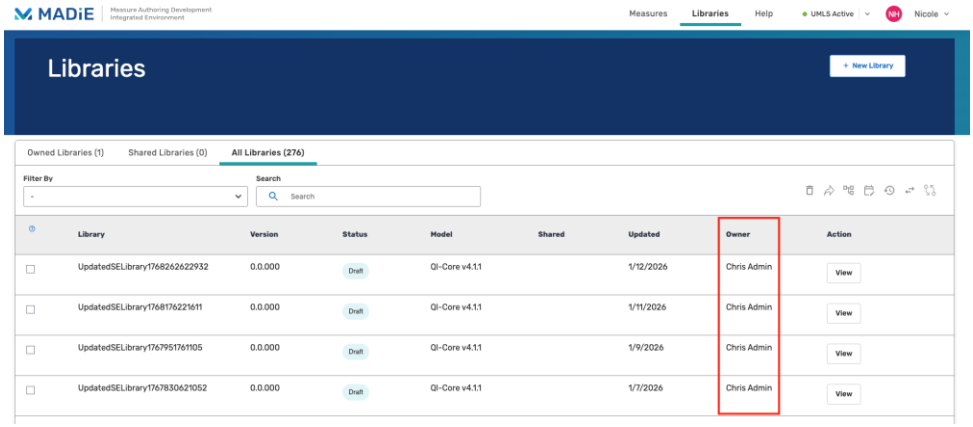


Image: All Libraries Tab – Library Owner

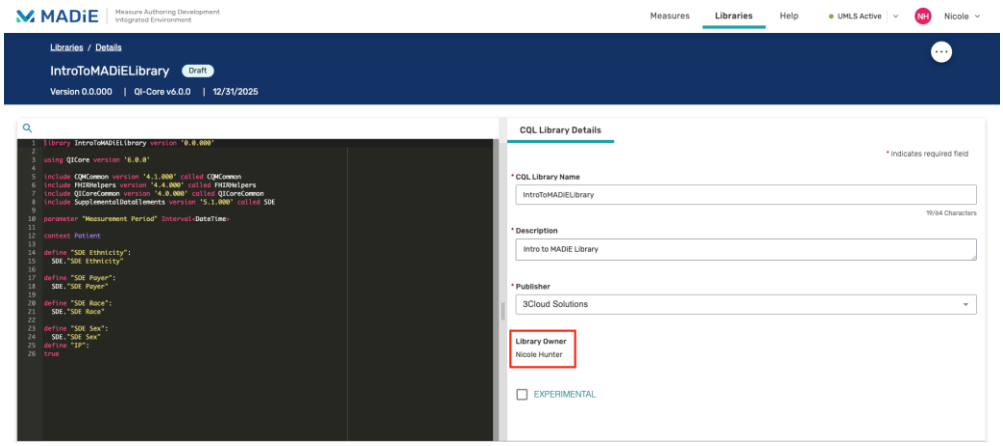


Image Edit Library – Library Owner

17.2 Adding or Removing Share Access for a Library

MADiE allows users two options for adding or removing share access for a library. Users can add or remove share access for measures they own directly in the UI. Or they can request it through the MADiE Help Desk.

17.2.1 Add or Remove Share Access Via MADiE UI

Users can share or unshare a library in the MADiE UI. Before starting this process, users need to have the HARP ids of the user the library is to be shared with or unshared with. Next, if users are on the library list page, select all the libraries to share or unshare and click the share icon. If on the library edit screen, open the library action center and click the share icon.

In both instances two options will be provided “Share With” and “Unshare.” To share, select “Share With.” A modal will appear listing the selected libraries with expandable and collapsible

rows. Once expanded the rows will display who they are already shared with, and the date the library was shared with them.

To share one or many libraries with a new user type the user's HARP ID into the HARP ID field and click "Add User." This will add the user as a shared user for all libraries shown in the table. To share one or many libraries with additional users, type the additional HARP ID for each user into the HARP ID field and click "Add User." To complete the share, click "Save." If the modal closes before "Save" is clicked, the updated share permissions will not take effect. **Note**: MADiE does not validate HARP IDs. If the users HARP ID entered is not valid the library will not be shared with the correct user.

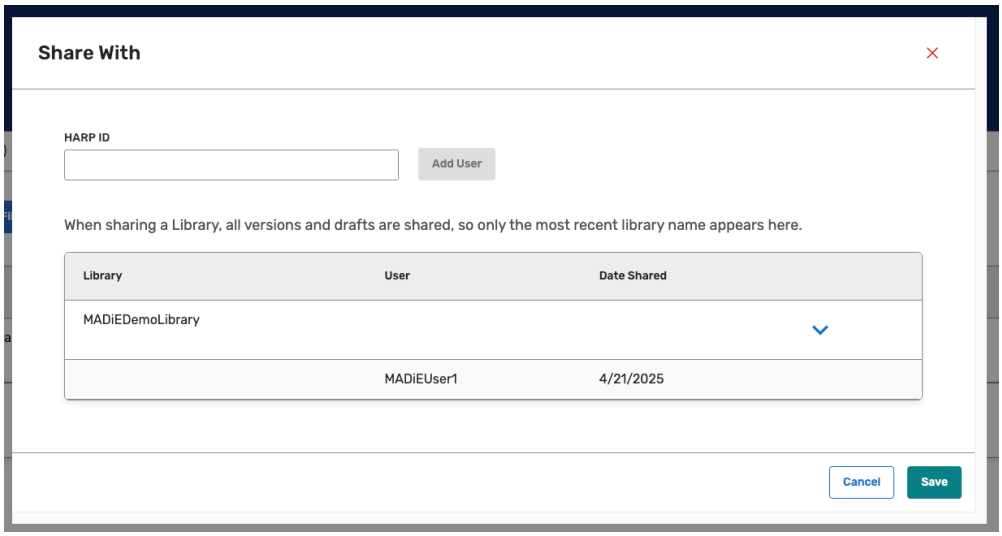


Image: Library Share With Modal

To Unshare with a specific user select the "Unshare" option in the dropdown. The unshare modal will appear. It will display the selected library with expandable and collapsible rows. Once expanded each row will show the users shared with that library, and the date they were shared. Each shared with user has a checkbox next to their row. To unshare with that specific user, uncheck the checkbox for the user(s) and click "Save." If the modal is closed prior to clicking "Save" the updated share request will not take effect.

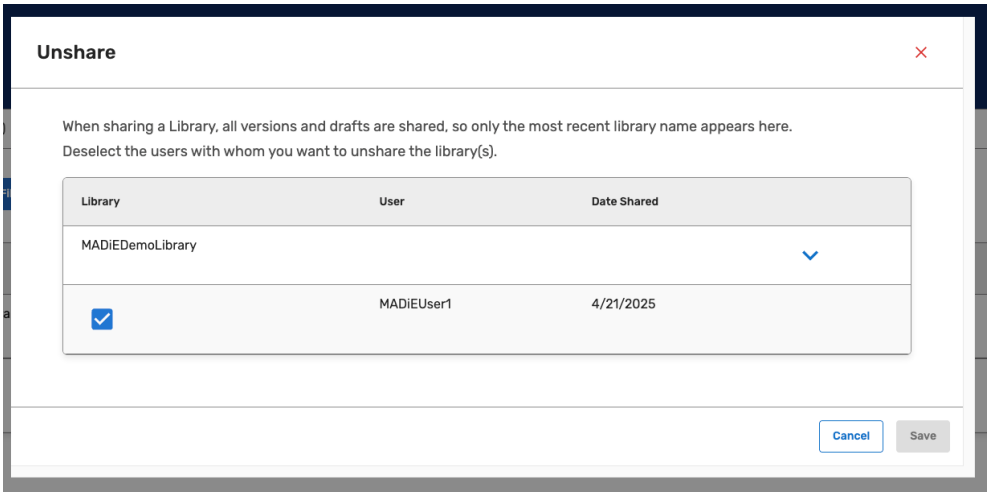


Image: Library Unshare Modal

17.2.2 Request Via Help Desk

To add share access to a library through the help desk, the library owner must complete the Share Request tab in the MADiE Add or Remove Measure and Library Sharing Request Form located on the Training & Resources tab of the public website and submit it via email to the Helpdesk at MADiE@cms.hhs.gov.mailto: To remove share access to a library, the library owner or the user the library is shared with must complete the Unshare Request tab in the MADiE Add or Remove Measure and Library Sharing Request Form located on the Training & Resources tab of the public website and submit it via email to the Helpdesk at MADiE@cms.hhs.gov.mailto:

**This form must be submitted via email and NOT submitted using the MADiE Jira Issue tracker as it contains HARP IDs

Please consider the following before submitting a request:

1. All existing and future library versions and drafts will be shared or unshared.
2. Once a library is shared, those who have access must coordinate to avoid overwriting each other's work. Overwriting prevention will not be immediately available and all users that the library is shared with will have access to the library without restriction.

If you want to update who your library is shared with, take the following steps:

1. Verify the library ID in MADiE.
2. Review who the library should be shared with
3. Collect the HARP IDs of the MADiE users with which the library is to be shared or unshared.
4. Complete the MADiE Add or Remove Measure and Library Sharing Request form found on the MADiE public website
    a. For Sharing: complete the Share Request tab

b. For Unsharing: complete the Unshare Request tab

5. Email the completed form to MADiE@cms.hhs.gov. mailto:

17.2.3 Unshare a Library Shared with Me

In MADiE, users have the ability to unshare libraries that were previously shared with them. This feature is especially helpful when transitioning between teams or when access to a particular library is no longer needed.

To unshare a library, begin by navigating to the Shared Libraries tab. From there, select the library or multiple libraries you wish to remove from your shared list. Once selected, click the "Unshare" icon, then "Unshare" from the drop down. A confirmation modal will appear, displaying all the libraries you've chosen to unshare along with your HARP ID.

At this point, you can either cancel the action by clicking "Cancel" or proceed by clicking "Accept". If you accept, the selected library will be unshared, meaning you will no longer have edit access to them, and they will be removed from your Shared Libraries tab.

This process ensures that your workspace remains relevant and streamlined, especially as your responsibilities or team affiliations evolve.

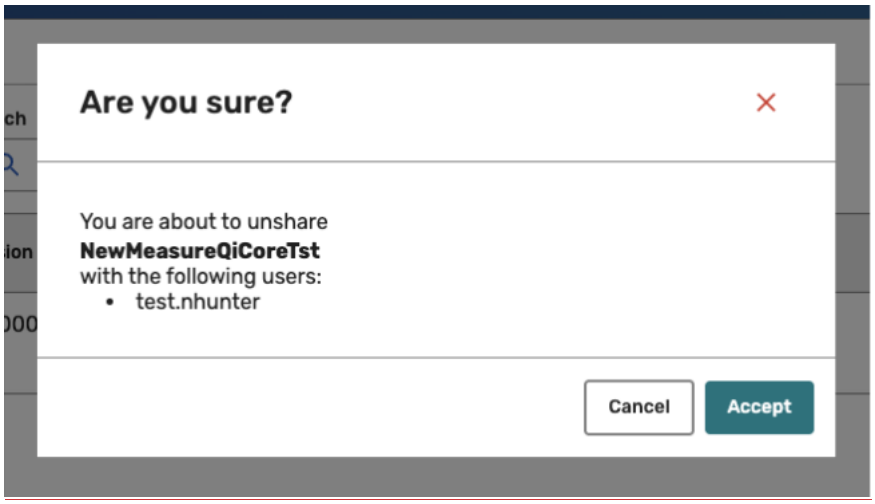


Image: Unshare a Library Shared with Me Modal

17.3 Transferring Library Ownership

MADiE allows user two options for transferring library ownership. Users can transfer library ownership directly through the UI. Users may also submit a request through the MADiE Help Desk. This ensures teams can maintain continuity and collaboration as roles shift or responsibilities change.

17.3.1 Transfer Ownership in UI

MADiE allows users to transfer ownership of one or multiple libraries at a time directly through the UI. To begin, users must first select the libraries they wish to transfer, then click the Transfer Library Icon in the Library Action Center. A modal will appear listing the selected libraries. Enter the HARP ID of the user you want to transfer the libraries to. Finally click Transfer, the libraries will then transfer ownership to the HARP ID of the user. **Note**: Entering an incorrect HARP ID will result in the library being reassigned from the original owner to the incorrect HARP ID. This will prevent the intended owner from accessing the library. Please double-check and ensure the correct HARP ID is entered.

Once the transfer is complete, the libraries will no longer appear in your Owned Libraries tab, they will now appear in the new owners Owned Libraries tab. If you wish to retain access to the library after transferring ownership, check the Retain Share Access after Transfer box before confirming the transfer. This will allow you to continue editing the measure in the Shared Libraries tab.

Note: Transferring library ownership is a permanent action and cannot be undone. Please confirm the recipient's HARP ID carefully before proceeding.

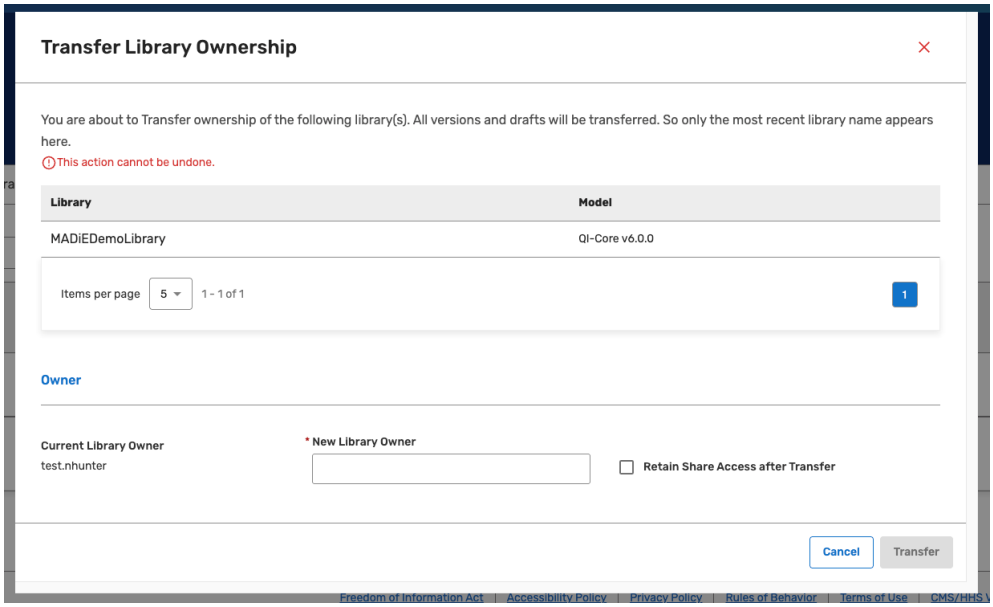


Image: Transfer Libraries Modal

17.3.2 Request via Help Desk

To transfer ownership of a Library through the Help Desk, the Library owner must complete the MADiE Measure or Library Ownership Transfer Request Form located on the Training & Resources tab of the public website and submit it via email to MADiE@cms.hhs.gov.mailto: **This form must be submitted via email and NOT submitted using the MADiE Jira Issue tracker as it contains HARP IDs.

The current Library owner needs to approve the request to transfer, so it is recommended, when possible, that the current Library owner send the email request
Once the request is processed, the new user will own the library and all library versions. The privileges of the initial owner are now passed to the new library owner. The new library owner will have the ability to draft, version, and delete. The initial owner will no longer have those privileges.

17.4 Library Ownership Permissions

The following table depicts different measure actions and what user has permissions to complete that action.

Measure Action	Owner	Shared User	No Share Access
View a Library	X	X	X
Compare Library Versions	X	X	X
Edit Library Meta Data	X	X	
Edit Library CQL	X	X	
Version or Draft a Library	X	X	
Deleting a Library	X		
Share/Unshare a Library in MADiE UI	X		
Request Share access through the help desk	X		
Request Unshare access through the help desk	X	X	
Request Library Transfer through the help desk	X		

17.5 Deleting a Draft Library

MADiE allows users to delete a draft library. Library drafts can be deleted by selecting “Delete” from the View/Edit dropdown on the My Libraries list. Engaging Delete will display a modal confirming if you would like to delete the library. **Note:** Only the library owner can delete the library.

18 Feedback and Support

An issue tracker and feedback email list are available to support the resolution of issues and to answer questions related to the MADiE application. The MADiE issue tracker is available on the ONC Jira System.

MADiE users should create a ticket in the issue tracker to report bugs, ask questions, or to request new features. To add an issue, users must create a login account in the Jira system. Once an issue has been entered, the MADiE team will review and prioritize it.

CMS Web Application Firewall (WAF) Errors can occur in MADiE. WAF errors occur when the attempted action (i.e., saving or exporting) is rejected by the CMS Security policy, blocking further action by the user. This can happen when doing any work within MADiE. If a WAF error is encountered, a pop-up message will display notifying the user they have encountered a WAF error, and they should contact the help desk. A support ID will be included in the pop-up. When a Support ID is provided in the error message, users should include that in the support ticket to help facilitate resolution by CMS.

Acronyms

Acronym	Definition
CMS	Centers for Medicare & Medicaid Services
CQL	Clinical Quality Language
CQM	Clinical Quality Measure
eCQM	Electronic Clinical Quality Measure
FHIR	Fast Healthcare Interoperability Resources
IP	Initial Population
JSON	JavaScript Object Notation
MADiE	Measure Authoring Development Integrated Environment
MAT	Measure Authoring Tool
NLM	National Library of Medicine
ONC	Office of National Coordinator for Health Information Technology
QI-Core	Quality Improvement Core
QDM	Quality Data Model
QMIG	Quality Measure Implementation Guide
UMLS	Unified Medical Language System
VSAC	Value Set Authority Center
XML	Extensible Markup Language